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Reference

FM 5-135

DEPARTMENT OF THE ARMY FIELD MANUAL

Reference

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**ENGINEER BATTALION
ARMORED, INFANTRY
AND
INFANTRY (MECHANIZED)
DIVISIONS**



**HEADQUARTERS, DEPARTMENT OF THE ARMY
NOVEMBER 1965**



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CHANGE

No. 1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 7 October 1968

**ENGINEER BATTALION, ARMORED, INFANTRY, AND
INFANTRY (MECHANIZED) DIVISIONS**

FM 5-135, 15 November 1965, is changed as follows:

1. Remove old pages and insert new pages as indicated below:

Old pages—	New pages—
i	i
1-1 and 1-2	1-1 through 1-4
6-21 through 6-23	6-21 through 6-23
7-9 through 7-12	7-9 through 7-13
10-3 through 10-6	10-3 through 10-6
A-1 through A-3	A-1 through A-4
B-5 through B-10	B-5 through B-9
None	E-1 through E-3

2. A star indicates new or changed material.
3. File this change sheet in front of the manual for reference purposes.

By Order of the Secretary of the Army:

W. C. WESTMORELAND,
General, United States Army,
Chief of Staff.

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Major General, United States Army,
The Adjutant General.

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FIELD MANUAL }
No. 5-135

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 15 November 1965

ENGINEER BATTALION, ARMORED, INFANTRY, AND INFANTRY (MECHANIZED) DIVISIONS

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*This manual supersedes FM 5-135, 30 November 1961.



CHAPTER 1

INTRODUCTION

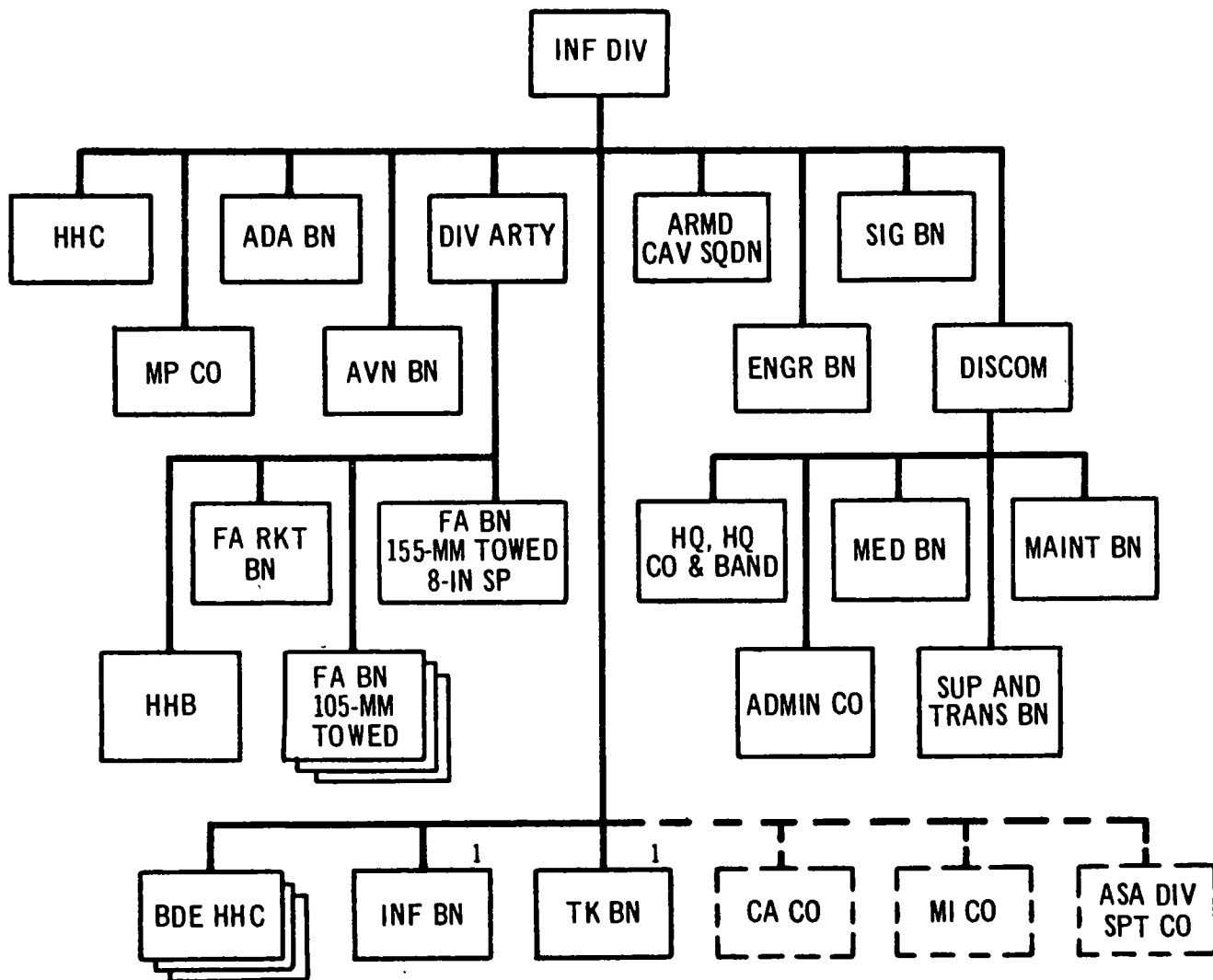
1-1. Purpose and Scope

a. This manual provides guidance for commanders, staff officers, and other personnel concerned with the employment of the divisional engineer battalions organic to the infantry, mechanized, and armored divisions.

b. This manual covers the organization, missions, capabilities, training, and operations of the divisional engineer battalions and their components (fig. 1-1, 1-2, and 1-3). When used with FM 5-1, which provides basic doctrine governing the activities of engineer troop units in a theater of operations, coverage is in sufficient detail to guide commanders and staffs in the accomplishment of the unit mission. The material presented is applicable without modification to both limited and general war, either nuclear or nonnuclear, and to cold war or stability operations.

1-2. Modification

Users of this manual are encouraged to submit recommended changes or comments to improve it. Comments should be keyed to the specific page, paragraph, and line of the text in which change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded directly to the Commanding Officer, U.S. Army Combat Developments Command Engineer Agency, Fort Belvoir, Va. 22060. Originators of proposed changes which constitute a significant modification of approved Army doctrine may send an information copy through command channels, to the CG, USACDC to facilitate review and followup.



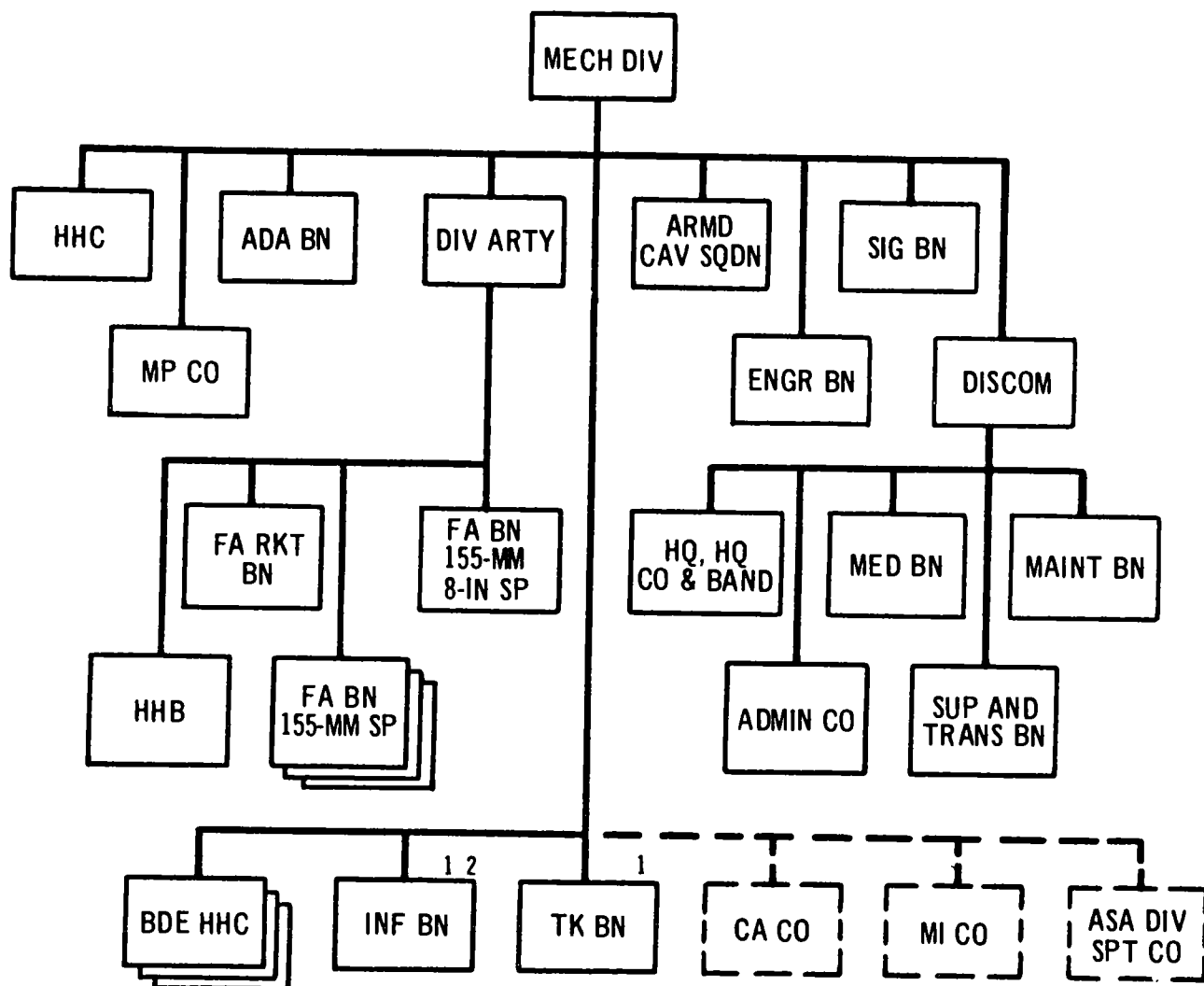
¹Number and type of battalions vary based on mission and operational environment.

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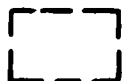
★Figure 1-1. Infantry division.



¹Number and type of battalions vary based on mission and operational environment.

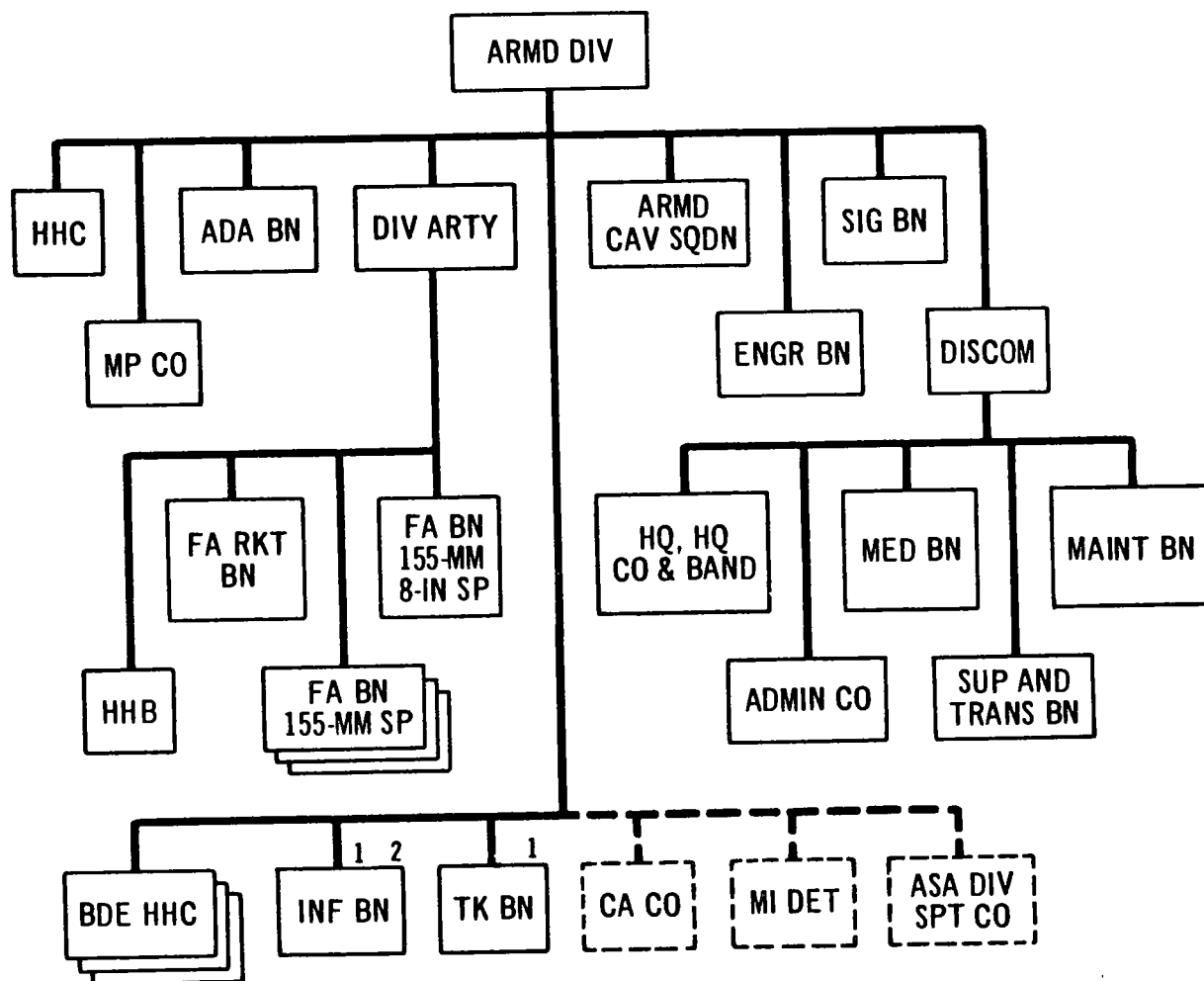
²Mechanized infantry.

LEGEND



Indicates normal attachment.

★Figure 1-2. Mechanized division.



¹Number and type of battalions vary based on mission and operational environment.

²Mechanized infantry.

LEGEND

 Indicates normal attachment.

★Figure 1-3. Armored Division.

6-27. Security at Worksites

a. The amount of security the engineer commander furnishes at the worksite depends on the engineer mission, guerrilla activity in the areas, the terrain, and the nearness of the enemy. For larger tasks, such as the engineer battalion constructing a road, the division usually provides the security forces. For smaller tasks, such as a company or platoon constructing a bridge, when security forces are not provided by the supported unit, the individual in charge of the construction project provides security with personnel from his unit.

b. In forward areas of the combat zone, the principal types of enemy action against which the working parties take security measures are dismounted patrols, motor or mechanized raids, and air attacks. Near the rear of the zone, there is less danger of enemy ground action, except guerrilla attacks. Air, nuclear, biological, and chemical attacks may occur anywhere.

★c. Enemy ground action usually can be guarded against by careful observation and by small security detachments covering probable avenues of approach. These may be supplemented by readily removable roadblocks, portable wire obstacles, and mines. The engineer in charge of the worksite withdraws as few men as possible from work to use for security. However, working parties are always prepared to defend against possible ground raids. They keep their weapons close at hand; and they are trained to react to their defensive positions, with their weapons, when they receive the warning.

★d. The engineer in charge of working parties prepares for security against air attack by training the parties in warning, concealment, dispersion, and fire. He trains the men to identify friendly and enemy aircraft. (See para 7-14 through 7-17 for employment of unit weapons against aircraft.) He posts guards at points of vantage; and he disperses and conceals equipment and vehicles which are not being used. He makes maximum use of the combat engineer vehicles and the personnel carriers, with their vehicular-mounted weapons. To provide security, when required, the indi-

vidual in charge of the worksite has machine-guns emplaced so that they can be used against low-flying aircraft. For protection against air attack on a major rear-area project, the responsible engineer officer requests air defense artillery through channels. He must, therefore, be completely familiar with local and general defensive artillery fire call procedures.

e. For security of ADM operations see FM 5-26.

6-28. Security Against Guerrilla Forces

Guerrilla bands usually employ offensive tactics characterized by surprise, mobility, deception, and decentralized operations (FM 31-16). The divisional engineer battalion commander insures that all engineer units are briefed on the fighting techniques of guerrilla forces. The precautions and countermeasures which the engineer units use against guerrillas vary with the nature of the threat. At halts, and in assembly areas, guards are posted at all times including periods of rest and recreation. Groups of local inhabitants of any considerable size are not allowed near the assembly area. Local civilians are subjected to rigid security checks before they are allowed to work in engineer installations. Working parties observe security precautions while they are working, resting, and eating, and when they are going to and from the jobs. When a party leaves a task to return to camp, it takes with it all tools, transportation, and readily removable equipment. A party returning to an incompleting task is alert for ambushes and boobytraps, and it gives special attention to the security of arms, ammunition, and other equipment of value to the guerrillas.

6-29. Security Against CBR and Nuclear Attacks

The engineer battalion commander is responsible for the security of the battalion and its components against chemical, biological, and radiological (CBR) and nuclear attacks. For information pertaining to unit protective and defense measures see FM 21-40, FM 3-12, and FM 101-31-1. For information pertaining to individual protection see FM 21-41. Individual and unit training procedures are contained in FM 21-48.

★ Section VIII. STABILITY OPERATIONS

6-30. The Environment

In stability operations many factors contribute to making the environment different from that of limited or general war. Among these factors are—

- a. The guerrilla attempts to select terrain which offers him an advantage by limiting the mobility of conventional forces.
- b. Forces usually are dispersed over an extremely wide area.
- c. The adversary generally is elusive, hard to identify, highly trained in the techniques of guerrilla warfare, and well motivated.
- d. Gaining and retaining the active support of the population is of paramount importance in stability operations. To preclude possible alienation of the people, all military actions and projects must be evaluated for possible adverse impact on the populace. Engineer units frequently devote significant effort to civic projects in addition to their normal combat support tasks.

6-31. Role of the Engineers

Divisional engineer battalions or elements thereof will support the division or divisional elements engaged in stability operations. Divisional engineers may also support the host country through independent operations. Engineer combat elements maintain their organizational integrity, but may be organized provisionally into task forces, depending upon the particular engineering skills and equipment required. For a general discussion of the engineer units in stability operations, see FM 31-22 and 31-23.

6-32. Engineer Capabilities

Engineer combat elements in a stability role may help a receiving state counter insurgency by—

- a. Providing traditional engineer assistance to indigenous military forces or to U.S. forces committed to stability operations.
- b. Providing training assistance and advice to host country engineer forces.
- c. Planning, organizing, and supervising construction projects to be carried out by indigenous personnel in accordance with U.S.

or host country civilian or military programs.

d. Making engineer surveys to support engineer projects and to provide a basis for increased engineer assistance should the insurgency escalate.

e. Providing assistance in military civic action projects (digging wells, building schools, water irrigation systems, land clearing and reclamation) designed to improve the well-being of the people and to encourage their support of the host country forces. Land clearing operations in heavily forested or jungle areas will require support of the specialized engineer land clearing company (TOE 5-87T). For operational details see chapter 5 of TM 5-330.

6-33. Special Considerations

When division engineer battalions are committed to stability operations, various problems and considerations not normally associated with conventional engineer operations will arise. Among these are the following:

a. Since units are usually dispersed over extremely wide areas, command supervision, to include training, maintenance, and other unit activities will be much more difficult.

b. Because of the nature of stability operations, the critical need for numerous construction projects, and the nationwide lack of engineering skills, there will be an especially heavy demand for engineer unit skills and knowledge.

c. With all engineer activities and projects generally susceptible to insurgent attack at any time, engineer unit commanders must insure that—

(1) Personnel are fully trained in the use of all unit weapons and are continually alert to possible surprise insurgent attack.

(2) Defense measures are taken around all engineer unit projects and activities.

d. Small unit commanders will be required frequently to make decisions based upon their own judgments, considering the situation at hand, rather than upon specific guidance and directions received from higher headquarters. The imagination and initiative of individual engineer commanders will especially contri-

bute to the effectiveness of the engineer effort in stability operations.

6-34. Civic Action Considerations

Engineering units are capable of undertaking many military civic action projects to improve the living conditions of the local populace. However, once a task is started it must be completed, since construction programs that are not completed furnish material for the insurgent propagandist. A carefully

planned and coordinated military civic action program, properly publicized, can create a favorable atmosphere and assist in developing a firm and stable government. A PSYOP campaign should be conducted before, during, and after the completion of an engineer project. Requests for psychological operations and civil affairs assistance should be forwarded to higher headquarters (see FM 33-1, FM 33-5, and FM 1-10).



from the sides of a road so that the road can be used as a landing strip, and filling craters or removing vegetation from an area of sufficient size to allow helicopter landings.

h. Preparation and Maintenance of Installations. Preparation and maintenance of support command installations in the division rear area will require engineer effort. The overtaxed Division Engineer Battalion may

be forced to seek nondivisional engineer aid to properly support this mission. This work will include emplacements for signal communications equipment, supplies, and preparation of areas for the medical battalion to receive mass casualties. The supply and transportation and maintenance battalions may also require assistance in preparing their areas.

Section III. DEFENSE AGAINST NUCLEAR ATTACK

7-10. Application

Although this section is in the chapter on defensive operations it is applicable generally to all forms of tactical operations, not only defensive.

7-11. Engineer Effort

Division headquarters will control the engineer effort in defense against nuclear attacks. Such engineer effort includes measures taken to reduce the vulnerability of friendly forces to nuclear attack and to facilitate their recovery after the attack. These measures include duplication, dispersion, deception, camouflage, and construction of major divisional shelters before a nuclear attack. They include reconstruction and assistance in decontamination and area damage control measures after the attack. The engineer effort expended on each task will be determined by the situation and the importance of the installation or facility to the division mission. The commander should weigh these measures in deciding on the employment of the engineer units in a damage control role. Nuclear defense is defined as the protective measures taken to minimize casualties and materiel damage from the blast and thermal and nuclear radiation effects of a nuclear weapon. It is interpreted to include measures such as—

- a.* Training and distribution of personnel with special reference to radiological specialists.
- b.* Preparation and maintenance of fixed and portable structures and equipment.
- c.* Teaching defense techniques and procedures, including use of detection equipment; protection or removal of exposed personnel;

and decontamination of personnel, equipment, structures, or terrain.

7-12. Prestrike Operations

Each commander is responsible for construction of installations required for radiological defense. He considers the protection to be gained through special types of construction, the location of new shelters, and special command posts. Additional prestrike tasks include the following, as time permits:

- a.* Survey of area for suitable shelter locations.
- b.* Disperse unit personnel, equipment, and supplies consistent with operational practicability.
- c.* Cover essential equipment and supplies with canvas or other material for protection against contamination.
- d.* Organize unit medical, rescue, and evacuation teams.
- e.* Organize a radiological defense warning system.
- f.* Prepare a radiological defense SOP based upon that of the next higher headquarters.
- g.* The division engineer is responsible for:
 - (1) Selection of alternate sites for water points.
 - (2) Selection and preparation of alternate bridge crossing operations.

7-13. Poststrike Operations

The engineer mission in case of a nuclear attack is expected to be essentially the same as for other types of attack, but to be complicated in practice by the destructive effects of nuclear weapons and the additional hazards of residual radiation. Rescue squads will be or-

ganized and equipped to remove casualties and to render first aid. Labor and equipment squads will be organized and equipped to clear debris, search for casualties, assist in decontamination, and evacuate materials. The removal of victims from the wreckage of collapsed buildings will often be a task requiring structural knowledge and engineering judgment. After the burst, engineers may be required to—

a. Perform first aid, rescue, and evacuation tasks.

b. Prepare personnel and equipment decontamination stations.

c. Make and post radiological contamination markers for contaminated areas.

d. Decontaminate vital areas or evacuate supplies to safe areas.

e. Fight fires.

f. Clear debris and trees from essential routes to facilitate relief, supply, and evacuation.

g. Remove or cover radioactive materials in contaminated areas.

h. Assist in the extrication of units or elements trapped by blowdown, rubble, and fire.

i. Produce potable water.

j. Provide information to division traffic headquarters on the status or routes to include estimates of times required to reopen closed routes.

k. Perform other special and general engineer tasks as required.

★ Section IV. EMPLOYMENT OF UNIT WEAPONS AGAINST AIRCRAFT

7-14. General

The low altitude air threat which may face divisional engineer combat units may be partially countered by aggressive use of the large volume of fire which unit organic weapons (rifles and machineguns) can place against this threat. Large volumes of fire from nonair defense weapons have proven capable of destroying both high and low speed aircraft or disrupting their attack. Use of unit weapons in this role must be balanced against the requirement to prevent disclosure of positions. The advent of forward air defense weapons such as Redeye and Chaparral/Vulcan will enhance the capability of countering the low altitude air threat.

7-15. Rules for Engagement

In the absence of orders to the contrary, personnel armed with individual weapons will engage attacking aircraft; engagement of all other hostile aircraft will be on orders issued through the unit chain of command and will be taken as requiring actions prejudicial to accomplishment of the primary mission of the unit.

7-16. Techniques

The following techniques should maximize the destructive and/or deterrent effect against aircraft. Aircraft may be divided into two

categories—low speed and high speed. Low speed aircraft include helicopters and liaison, reconnaissance, and observation fixed wing propeller aircraft. High speed aircraft include all other propeller aircraft and all jet fixed wing aircraft. This distinction will result in simplified engagement procedures.

a. *Engagement of Low Speed Aircraft.* In accordance with the rule for engagement, engage low speed enemy aircraft with aimed fire, employing the maximum weapon rate of fire. Aerial gunnery techniques generally applicable to all small arms and automatic weapons are presented in FM 23-65.

b. *Engagement of High Speed Aircraft.* In accordance with the rule for engagement, engage high speed enemy aircraft with maximum fire aimed well in front of the aircraft, and above its flightpath, in order to force it to fly through a pattern of fire. This technique is not unaimed "barrage" fire, but requires a degree of aimed fire. It does not, however, call for careful estimation of aircraft speed and required lead.

c. *Use of Tracer Ammunition.* This type of cartridge is intended for use with other types to show the gunner, by its trace, the path of the bullets, thus assisting in correcting aim.

Individual weapons should utilize the highest practical proportion of tracer ammunition for this purpose and to enhance the deterrent or disruptive effect. Tracer ammunition will also reveal friendly positions to the enemy. Limited use of tracer ammunition should be considered if engagement is desired without totally fixing friendly positions.

d. Massed Fire. Units should employ a massed fire technique when using small arms and automatic weapons in an air defense role.

7-17. Standing Operating Procedure

Battalion and company SOP should cover, but not be limited to, the following items relevant to engagement of aircraft with nonair defense weapons:

a. Applicability. Operators of designated weapons.

b. Relation to Primary Mission. Primary mission is never prejudiced.

c. Relation to Passive Air Defense. The necessity for aggressively engaging hostile air-

craft is balanced with the requirement to place in proper perspective the tactic of withholding fire to preclude disclosure of position.

d. Authority to Engage. Authority to engage attacking aircraft is delegated to personnel armed with individual weapons and to engage all other hostile aircraft on order through unit chain of command, subject to the rules for engagement.

e. Rules for Engagement. Normally self-defense only against all attacking aircraft and those positively identified enemy aircraft which pose a threat to the unit.

f. Rules for Withholding Fire. When ordered. When not positive that aircraft are actually enemy. When friendly aircraft or troops are endangered.

g. Firing Techniques. Lead and superelevation. Massed fire. Maximum rate of fire. Maximum use of tracer ammunition.

h. Unit Training Requirements. Motivation and discipline. Gunnery. Aircraft recognition.

★ Section V. ENGINEER RESPONSIBILITIES IN RETROGRADE MOVEMENTS

7-18. Retrograde Movements

a. Introduction. Retrograde movements are movements to the rear or away from the enemy, and are classified as withdrawals, delaying actions, and retirements (see FM 61-100).

b. Conduct. Within a division in contact with the enemy a combination of these retrograde operations may be conducted simultaneously or in sequence as one operation develops into another. Such operations may be forced by enemy action or may be executed voluntarily. In either event, the operation must be approved by the higher commander. A well planned, well organized, and aggressively executed retrograde operation provides opportunities for inflicting heavy damage to enemy troops and material. In the conduct of a retrograde operation, the division will employ a combination of offensive, defensive, and delaying tactics. Because of their inherent characteristics of tactical mobility and extensive communications, the armored and mechanized divisions can cover a wider front in retrograde operations than the infantry division.

7-19. Purpose

Retrograde movements are conducted to accomplish one or more of the following:

a. To harass, exhaust, inflict punishment upon, resist, and delay the enemy.

b. To draw the enemy into an unfavorable situation.

c. To permit the employment of all or a portion of the command elsewhere.

d. To avoid combat under undesirable conditions.

e. To gain time and avoid fighting a decisive engagement.

f. To disengage from battle.

g. To conform to movement of other friendly troops.

h. To shorten lines of communication.

7-20. Withdrawals

Withdrawals may be executed either during daylight or at night and may be forced or voluntary. Voluntary withdrawals are favored over involuntary withdrawals since the former are conducted without direct enemy pressure. Voluntary withdrawals provide freedom of ac-

tion, facilitate deception, and reduce the effectiveness of observed enemy fires. A withdrawal under enemy pressure is avoided, if possible, because observed enemy fires may result in heavy casualties and loss of freedom of action. Regardless of the type withdrawal being conducted, contact is maintained with the enemy forces.

7-21. Delaying Action

The division accomplishes a delaying mission by delay on successive positions, delay on alternate positions, or by a combination of the two techniques. Continuous delay is inherent in each of the techniques and requires constant contact with the enemy by some portion of the delaying force, including the use of long range firepower and maneuver, to cause him to deploy, reconnoiter, maneuver, and take other time-consuming measures. Delay on alternate positions can only be used when the division can accomplish its mission and occupy two positions simultaneously. This normally will occur when the frontage assigned the division is relatively narrow. Delay on successive positions may be used when a relatively wide front is assigned to the division. In either technique, continuous delay is sought on and between positions. Delaying positions should be far enough apart to cause the enemy to regroup prior to continuing the attack from one position to the next. Delaying positions are sought which incorporate the following:

- a. A series of parallel ridges across the lines of hostile advance.
- b. Unfordable streams, swamps, lakes, and other obstacles on the front and flanks.
- c. High ground with good observation and long-range fields of fire.
- d. Concealed routes of withdrawal.
- e. A road net and/or areas providing good cross-country trafficability.

7-22. Retirement

A retirement may be made following a withdrawal or when there is no actual contact with the enemy. When a withdrawal precedes a retirement, the retirement begins after the main forces have broken contact with the enemy and march columns have been formed. Security for the main body is provided

by advance, flank, and rear guards. When the retirement is preceded by a withdrawal, a strong rear guard will be required to employ delaying tactics if it is taken under fire, to delay the advancing enemy and to prevent interference with the movement of the main body.

7-23. Engineers in Retrograde Operations

a. Engineers may be placed in direct support, general support, or attached to, combat maneuver units as the situation demands. Execution of the division barrier plan, construction of obstacles and rearward positions, and road maintenance may dictate a centralized engineer effort. The requirements for engineers by units in contact with the enemy may dictate attachment of engineers to them. Brigades may further place engineers in direct support of battalion task forces. Unless additional engineers support is furnished from outside the division, attachment of engineers to combat units may decrease the effectiveness of the engineer effort.

b. One of the most important functions of the engineers will be to provide advice and assistance in the overall formulation and implementation of the barrier plan. Barriers (obstacles) are used by the retrograde commander to delay the enemy or canalize him into areas where he can be destroyed with nuclear or nonnuclear fires. Well-planned and widespread use of barriers, to include chemical contaminated barriers, assists in gaining time and in avoiding close pursuit. Subsurface or surface nuclear demolitions may be employed to create craters and contaminated areas, and to slow or impede the enemy's advance (see FM 5-26). Barrier plans are coordinated with higher headquarters to prevent interference with future operations. The barrier plan is developed and prepared as an annex to the operations order (plan) by the division engineer in coordination with the G3 (responsible staff officer).

c. Detailed plans are prepared for demolitions along enemy avenues of approach and those routes which lead into the division sector. Particular attention is given to the destruction of bridges and tunnels. Demolitions are placed in defiles and on routes traversing

natural and artificial obstacles as well as lateral routes through the division sector. Demolition plans include—

(1) Provisions for placing and firing the necessary demolitions.

(2) Adequate guards to prevent premature firing of charges or seizure by enemy infiltrators.

(3) Fixed responsibility for the destruction of bridges.

(4) Schedule for destroying bridges no longer needed by friendly forces.

(5) Covering by fire, including chemical or nuclear fires, those obstacles created by demolitions or other means.

d. The destruction of bridges is of major importance to the retrograde force commander. Care is exercised to insure that bridges are not destroyed prematurely or that they are not seized intact by the enemy. To accomplish this, responsibility for destroying

bridges within his sector is delegated to the tactical commander. This delegation of responsibility is often subject to specific restrictions imposed by the higher commander. A demolition firing party and a demolition guard are designated for each bridge to be destroyed. The guard commander has the authority to destroy the bridge, subject to conditions established by the higher commander. A list of all units that are to use the bridge is furnished the guard commander. Each unit commander notifies the guard commander when his unit has cleared. After the main body has crossed, the majority of the bridges in the sector are destroyed. Certain predesignated bridges are left for use by security elements. The demolition guard commander is responsible for destroying the bridge to prevent its capture by the enemy, but will do so only in accordance with the provisions of the demolition plan (app D).



He must be careful to insure that these plans conform to the directives of higher headquarters and that they are sufficiently comprehensive. He coordinates with S2 for estimates on prisoners anticipated and facilities for any interrogation desired, and with S3 for necessary guards for prisoners while they are being evacuated. He coordinates with S4 for transportation to evacuate prisoners of war and with the battalion surgeon for evacuation of wounded prisoners.

★ 10-3. Supply Functions

The principal functions performed by the battalion in supply matters are those of acquisition and evaluation. The battalion draws supplies from supporting units and makes distribution within the battalion. It also takes excess or unserviceable supplies from subordinate units and disposes of them through prescribed channels. The property responsibilities of the commanders are identical with those of commanders at all echelons. These command responsibilities are to insure that all property pertaining to the command is adequately administered, safeguarded, accounted for, and used.

★ 10-4. Supply Responsibilities

a. Battalion Commander. The battalion commander discharges his supply responsibilities through the supply staff officer (S4). He insures that commanders of subordinate units properly conduct supply functions within their commands. He checks on the efficiency of supply operations through frequent personal inspections and by reports of inspections turned in by his S4. Immediate action to correct supply problems or discrepancies found as a result of inspections is the responsibility of the commander. He must insure that his staff accomplishes proper corrective action.

b. Battalion Supply Officer (S4). The battalion supply officer (S4) is responsible for closely supervising the supply activities of all subordinate units. He maintains informal accountability for all military property in the possession of these units. His operations support the tactical plan and are based upon the orders of higher headquarters. He has primary staff responsibility for the provision of ADM

and associated equipment and functions as the division water supply officer. He coordinates with the other staff sections of the battalion, the S4 or G4 of the next higher headquarters, and all supply establishments which are his sources of supply. He also coordinates and establishes liaison with all maintenance agencies which support the battalion. The primary functions of the S4 include—

(1) Supervising the battalion supply section and maintenance section.

(2) Maintaining liaison with installation supply and maintenance activities.

(3) Training supply personnel.

(4) Providing guidance to unit commanders on problems concerning supply.

(5) Informing the battalion commander on the status of supply operations within all elements of the command.

(6) Establishing and maintaining the property books and property records for the battalion and its elements. Duties of the property book officer are normally assigned to the supply warrant officer and include—

(a) Maintaining battalion and installation property books.

(b) Maintaining a transaction register to reflect all supply actions initiated by the battalion.

(c) Initiating all supply requisitions and turn-ins.

(d) Preparing adjustment transactions as required.

(e) Maintaining a file of vouchers to support property book and transaction register entries.

c. Company Commander. The company commander is responsible for the supply and administration of the company and any attached elements. He makes timely requests for supplies and distributes them. The company commander is assisted in these duties by the company officers, the first sergeant, the mess steward, the supply sergeant, and the motor sergeant. The specific responsibilities of a company commander in connection with property administration are quite extensive. He must—

(1) Have in his possession, in serviceable condition, all items authorized his company.

(2) Determine by frequent inspection that all prescribed items of authorized equipment in the possession of officers or enlisted men are on hand and serviceable.

(3) Insure that all personnel, both officer and enlisted, are instructed in the proper methods of use, care, and maintenance of property, and that the instructions are followed.

(4) Maintain individual clothing records, and such other records as are necessary to assure that the status of the property for which he is responsible is accurately reflected at all times.

(5) Obtain acceptable vouchers to cover loss, damage, or destruction to property for which he is responsible, and process these vouchers in accordance with appropriate regulations.

(6) Upon transfer of property responsibility to his successor, take joint inventory, and initiate action to adjust discrepancies.

(7) When desired, designate one or more authorized representatives to receipt for property in his name. The representative may be any member of his command, commissioned, warrant, or enlisted. The fact, however, that property is receipted for by a representative of the commander does not in any way reduce his own responsibility for that property.

(8) Assume responsibility for all government property under his control, whether receipted for or not.

d. Platoon Leader. The platoon leader is responsible for the equipment organic to his platoon. This equipment is issued to him by the battalion S4. He inspects the platoon to see that it is properly equipped and that any shortages are replaced. He insures that the platoon is fed, and that supplies and materials are replenished. He informs the company commander of any discrepancies. He checks on the timely delivery of replacement items.

★ 10-5. Supply Procedures

a. Maps. Distribution of maps is accomplished by the supply and transportation battalion in accordance with priorities of allocations made by the G2, in coordination with the engineer battalion S2 and the division G3.

Quantities are based on army tables of map allowances. The engineer battalion S2 obtains and distributes maps for the battalion.

b. Class I Supply. The battalion S4 forwards the battalion's requirements for class I supplies to the supply and transportation battalion. Normally, rations are delivered to the supply and transportation battalion, which breaks down the bulk supplies into unit lots. Depending on whether unit or supply point distribution is in effect, the supply and transportation battalion delivers rations to the engineer battalion area or the engineer battalion uses its organic transportation to pick up the rations at the prescribed class I distributing point. In either case, the battalion S4 breaks down and distributes rations to the company kitchens. When companies are in support of brigades and time and distance make this method of supply infeasible, the battalion S4 and the company commander concerned make appropriate arrangements with the division support command commander and the S4 of the supported brigade.

c. Class II Supply. Class II supplies, clothing, tentage, organizational tool sets and kits, handtools, administrative, housekeeping supplies and equipment are handled by the supply and transport battalion. The battalion S4 forwards the battalion requirements directly to the supply and transport battalion. Fast moving class II supplies are forwarded directly from the army supply points or depots to the division class II distributing point in the division area or, where appropriate, directly to the battalion or company. Unit distribution of fast moving class II items directly to the battalion or to elements of the supply and transportation battalion operating with the brigade trains is desirable. Normally, a combination of unit and supply point distribution will be employed.

d. Class III Supply. The battalion S4 submits a periodic forecast for POL products to the supply and transportation battalion, indicating any change to the previously experienced supply rates. Class III may be delivered to the engineer battalion area by tankers of the supply and transportation battalion, or the engineer battalion may use its trailer-mounted

fuel tanks to draw vehicle fuel from the class III distributing points which are established normally by the supply and transportation battalion in the division support and brigade trains areas. Individual vehicles moving to the rear on other tasks habitually replenish their fuel at division mobile filling stations.

e. Class IV Supply. Construction materials including installed equipment and all fortification barrier materials are normally delivered by the army supply points supporting the division and are carried as far forward as possible without transshipment. The battalion S4 forwards the battalion requirements directly to the supply and transport battalion.

f. Conventional Class V Supply. Ammunition requisitions for class V are prepared by the battalion S4 and are presented at the division ammunition office for authentication by the division ammunition officer (DAO) who normally is located in the division support area. He may be located at the army ammunition supply point (ASP). Class V normally is supplied through supply point distribution. The battalion does not carry a reserve class V. The only ammunition held in the battalion is in the company basic loads. Supply procedures are described in FM 9-6. (Ammunition supply procedures for the Divisional Engineer Battalion must include provisions for increased rate of ammunition supply when they fight as infantry.)

g. Special Class V Supply. Special ammunition supply procedures are described in FM 101-10-3 and 9-6.

h. Class VI Supply. Personal demand items (non-military sales items) will normally be available where the combat situation permits and when authorized by division headquarters.

i. Class VII Supply. Major end items, such as tanks, mobile machine shops, and vehicles, are delivered as authorized and requested by the division support command.

j. Class VIII Supply. Medical material, including medical peculiar repair parts, are handled by the medical battalion. Divisions draw their medical supplies from the advance platoon supporting the corps to which the divisions are attached.

k. Class IX Supply. Repair parts and components (less medical peculiar repair items) are supplied by the division maintenance battalion. This class includes all repair parts and components, kits, assemblies, subassemblies, repairable and nonrepairable, required for maintenance support of all equipment.

l. Class X Supply. Class X supply includes material required to support non-military programs such as agriculture and economic internal development programs within a host country which is not included in Classes I-IX.

★10-6. Water Purification (SOLOG 125) (Appendix E)

a. Water Production Teams. The divisional engineer battalion has five water production teams, with five water purification sets. It has enough transportation, specialists, and helpers to operate the sets independently in establishing the water points required by the division. Normally one team provides area support in each brigade area base, one team provides area support in the division rear base, and one is kept in reserve. Whether sent to a specific location or attached to an engineer company, the team operates alone. The location of the team determines how it gets its rations. It may be attached to an adjacent unit for rations; rations may be delivered to it by the engineer company to which it is attached or by headquarters company; or the team may prepare its own food on small cooking units.

b. Water Points. With the water purification sets, the water production teams establish the water points required by the division. Each unit of the division draws water from the point nearest it. Water point locations are reported to the supported brigade and to the engineer battalion headquarters. Battalion, in turn, reports these locations to the G4.

c. Sources of Water. Water usually is obtained from local sources determined by reconnaissance by S2 personnel. It is made potable with water purification equipment organic to the engineer battalion. When a source of water is not available in the division area, the division engineer has the staff responsibility for obtaining water elsewhere and stocking it at division water points.

d. Operation of Water Points. The tactical situation and the sources of water normally dictate the location and hours of operation of water point. Road nets, parking areas, and concealment are only slightly less important considerations. Normally, units are permitted to draw water at any time the water point is in operation. If water is limited in quantity or the demand excessive, units may be permitted to draw water only at scheduled times. Normally, the G4 establishes these schedules. Units should draw water as soon as practicable after the opening of the water point, as the water purification equipment must be dismantled before the next move in time to accompany the force which it is supporting. The battalion S4 is responsible for coordination of displacement of water points with the water point teams and with G4 for close-out times of old points and opening times and locations of new points; and for coordination with the battalion S3 for preparation of water point sites, with the division surgeon for water purity control, and with the provost marshal for traffic control.

10-7. Maintenance

a. Organizational Maintenance. The battalion maintenance section, under the control of the maintenance warrant officer, insures that the organizational maintenance requirements of the battalion are satisfactorily met. Incoming repair work is checked to see if proper operator maintenance has been performed and to determine the extent of repairs needed. Completed work is checked to see that equipment is in operating condition before it is released from the maintenance section shop. The

battalion maintenance section also provides technical help to company motor pool personnel.

b. Direct Support Maintenance. The maintenance battalion of the support command provides direct support maintenance for all material except medical, electric accounting, quartermaster air, and cryptographic equipment. Normally, one forward support company is placed in support of each brigade and operates in the brigade trains area. It provides direct support maintenance for construction, tank-automotive, and electronic equipment for the units in the area. The forward support company has a limited materiel recovery and evacuation capability. The main support company operates in the division support area, providing direct maintenance support to the division elements not supported by the forward support companies, and backup maintenance support to the forward support companies. The battalion maintenance section requisitions repair parts from the support company designated. The basis of requisition will be to replenish its prescribed load of repair parts.

c. Evacuation of Damaged Material. Units of the battalion are responsible for initial recovery of damaged equipment. Large items such as cranes or other vehicles may be evacuated to the brigade axis of evacuation or to division collection points. Small items are evacuated to the collection points. The main support company of the maintenance battalion operates the main division collection point and provides evacuation service for the materiel supported.

APPENDIX A

REFERENCES

A-1. Department of the Army Pamphlets (DA Pam)

- | | |
|------------|--|
| 310-series | Indexes Pertaining to Administration, Training, Maintenance, and Supply. |
| 750-1 | Preventive Maintenance Guide for Commanders. |

A-2. Army Regulations and Special Regulations (AR and SR)

- | | |
|-------------|---|
| 55-203 | ★Movement of Nuclear Weapons and Nuclear Components. |
| 190-60 | Physical Security Standards for Nuclear Weapons. |
| 220-15 | Journals and Journal Files. |
| 320-5 | Dictionary of United States Army Terms. |
| 350-1 | Army Training. |
| 380-5 | Safeguarding Defense Information. |
| 600-20 | Army Command Policy and Procedures. |
| 611-101 | Manual of Commissioned Officer Military Occupational Specialties. |
| 611-112 | Manual of Warrant Officer Military Occupational Specialties. |
| (C) 611-202 | Enlisted Military Occupational Specialties (U). |
| 622-5 | Qualification and Familiarization. |
| 750-1 | Maintenance Concepts. |
| 750-8 | Command Maintenance Management Inspections. |

A-3. Field Manuals (FM)

- | | |
|-------|--|
| 3-10 | Chemical and Biological Weapons Employment. |
| 3-12 | Operational Aspects of Radiological Defense. |
| 3-50 | Chemical Smoke Generator Units and Smoke Operations. |
| 5-1 | Engineer Troop Organizations and Operations. |
| 5-15 | Field Fortifications. |
| 5-20 | ★Camouflage. |
| 5-22 | Camouflage Materials. |
| 5-23 | Field Decoy Installations. |
| 5-25 | Explosives and Demolitions. |
| ★5-26 | Employment of Atomic Demolition Munitions (ADM). |
| 5-29 | Passage of Mass Obstacles. |
| 5-30 | Engineer Intelligence. |
| 5-31 | Booby Traps. |
| 5-34 | Engineer Field Data. |
| 5-35 | Engineers' Reference and Logistical Data. |
| 5-36 | Route Reconnaissance and Classification. |
| 5-142 | Nondivisional Engineer Combat Units. |
| 5-144 | ★Engineer Amphibious Units. |

- ★5-162 Engineer Construction and Construction Support Units.
- 7-11 ★Rifle Company, Infantry, Airborne, and Mechanized.
- 7-20 Infantry, Airborne Infantry, and Mechanized Infantry Battalions.
- 7-30 Infantry, Airborne, and Mechanized Division Brigades.
- ★8-15 Medical Service in Divisions, Separate Brigades, and the Armored Cavalry Regiment.
- 8-35 Transportation of the Sick and Wounded.
- 8-50 Bandaging and Splinting.
- 9-6 ★Ammunition Service in the Theater of Operations.
- 9-30 Maintenance Battalion, Division Support Command.
- 10-50 Supply and Transport Battalion, Division Support Command.
- 10-63 Handling of Deceased Personnel in Theaters of Operations.
- ★11-50 Signal Battalion, Armored, Infantry, and Infantry (Mechanized).
- 12-11 ★Administration Company, Division and Separate Brigade.
- 17-1 Armor Operations.
- 17-15 Tank Units; Platoon, Company, and Battalion.
- 17-30 The Armored Division Brigade.
- 19-40 Enemy Prisoners of War and Civilian Internees.
- 20-32 Land Mine Warfare.
- 20-33 Combat Flame Operations.
- 21-5 Military Training Management.
- 21-6 Techniques of Military Instruction.
- 21-10 Military Sanitation.
- 21-11 First Aid for Soldiers.
- 21-26 Map Reading.
- 21-30 Military Symbols.
- 21-40 ★Chemical, Biological, and Nuclear Defense.
- 21-41 Soldiers' Handbook for Chemical and Biological Operations and Nuclear Warfare.
- 21-48 Chemical, Biological, and Radiological (CBR) and Nuclear Defense Training Exercises.
- 21-60 Visual Signals.
- 22-5 Drill and Ceremonies.
- ★24-1 Tactical Communications Doctrine.
- 24-18 Field Radio Techniques.
- 24-20 Field Wire and Field Cable Techniques.
- 27-10 The Law of Land Warfare.
- 30-5 Combat Intelligence.
- 30-10 Terrain Intelligence.
- 31-10 ★Denial Operations and Barriers.
- ★31-16 Counter guerrilla Operations.
- 31-22 U.S. Army Counterinsurgency Forces.
- 31-23 Stability Operations—U.S. Army Doctrine.
- 31-25 Desert Operations.
- 31-30 Jungle Training and Operations.
- ★(C) 31-40 Tactical Cover and Deception (U).
- 31-50 Combat in Fortified and Builtup Areas.
- 31-60 River Crossing Operations.
- 31-70 Basic Cold Weather Manual.
- 31-71 Northern Operations.

31-72	Mountain Operations.
31-1	Psychological Operations—U.S. Army Doctrine.
★33-5	Psychological Operations Techniques and Procedures.
★41-10	Civil Affairs Operations.
54-2	Division Support Command.
61-100	The Division.
100-5	Field Service Regulations—Operations.
100-10	Field Service Regulations—Administration.
★100-20	Field Service Regulation—Internal Defense and Development.
101-5	Staff Officers' Field Manual; Staff Organization and Procedure.
101-10-1	Staff Officers' Field Manual; and Organizational, Technical, and Logistical Data—Unclassified Data.
101-10-2	Staff Officers' Field Manual; Organizational, Technical, and Logistical Data—Extracts of Tables of Organization and Equipment.
(S) 101-10-3	Staff Officers' Field Manual; Organizational Technical and Logistical Data—Classified Data (U).
101-31-1	★Staff Officers' Field Manual; Nuclear Weapons Employment Doctrine and Procedures.
(S) 101-31-2	★Staff Officers' Field Manual; Nuclear Weapons Employment Effects Data (U).
101-31-3	★Staff Officers' Field Manual; Nuclear Weapons Employment Effects Data.

A-4. Technical Manuals (TM)

3-210	Fallout Prediction.
3-220	Chemical, Biological, and Radiological (CBR) Decontamination.
3-1040-209-series	Flamethrower, Mechanized Main Armament, M10-8.
5-210	Military Floating Bridge Equipment.
5-216	Armored Vehicle Launched Bridge.
5-220	Passage of Obstacles Other Than Minefields.
5-277	★Bailey Bridge.
★5-301	Staff Tables of Engineer Functional Components System.
5-302	Construction in the Theater of Operations.
★5-303	Bills of Materials and Equipment of the Engineer Functional Components System.
★5-311	Military Protective Construction (Nuclear Warfare and Chemical and Biological Operations).
5-312	Military Fixed Bridges.
5-330	Planning, Site Selection, and Design of Roads, Airfields, and Heliports in the Theater of Operations.
5-335	Drainage Structures, Subgrades, and Base Courses.
5-460	Carpentry and Building Construction.
5-461	Engineer Handtools.
5-700	Field Water Supply.
5-725	Rigging.
★9-1300-214	Military Explosives.
9-1375-200	Demolition Materials.
21-200	Physical Conditioning.
21-300	Driver Selection and Training (Wheeled Vehicles).

C 1, FM 5-135

21-301	Driver Selection, Training, and Supervision; Tracked Vehicles.
38-750	Army Equipment Record Procedures.
38-750-1	Maintenance Management; Field Command Procedures.

A-5. Army Training Programs (ATP)

5-25	Engineer Combat Units.
21-114	Male Military Personnel Without Prior Service.

- c. Reserve Rations Carried.
 - (1) By unit.
 - (2) By individual.
 - d. Responsibility for Attached Units.
- 31. WATER PROCESSING AND PURIFICATION
 - a. Authorized Sources.
 - b. Purification by Expedient Methods.
 - c. Water Economy.
- ★32. CLASS II SUPPLY
 - a. Requisition Procedure.
 - b. Pickup Procedure.
 - c. Salvage.
- ★33. CLASS III SUPPLY
 - a. Requisition Procedure.
 - b. Delivery Procedure.
 - c. Fuel Sources.
- ★34. CLASS IV SUPPLY
 - a. Requisition Procedure.
 - b. Pickup Procedure.
 - c. Basic Loads, Annex J.
 - d. Salvage.
- ★35. CLASS V SUPPLY
 - a. Requisition Procedure.
 - b. Forms Used and Certificates Required.
 - c. Basic Load.
 - d. Salvage.
- ★36. CLASS VI SUPPLY—As directed by Division Commander.
- ★37. CLASS VII SUPPLY
 - a. Requisition Procedure.
 - b. Salvage.
- ★38. CLASS VIII SUPPLY
 - a. Requisition Procedure.
 - b. Critical Items Delivery and Storage.
- ★39. CLASS IX SUPPLY
 - a. Requisition Procedure.
 - b. Stock Levels.
 - c. Salvage.
 - d. Records.
- ★40. CLASS X SUPPLY
 - a. Requisition Procedure.
 - b. Pickup Procedure.
- ★41. MAINTENANCE OF VEHICLES AND EQUIPMENT
 - a. Organizational Maintenance.
 - b. Maintenance Officer's Responsibilities.
 - c. Forms Used.
 - d. Priorities.
- ★42. EVACUATION OF VEHICLES AND EQUIPMENT
 - a. Division Support Command.
 - b. Maintenance Battalion.
- ★43. EVACUATION AND HOSPITALIZATION—Annex K.

Section VII. COMMUNICATIONS

★44. COMMUNICATION BETWEEN UNITS

- a. Radio (FM 24-18). Annex L.
- b. Wire (FM 24-20). Annex M.
- c. Responsibility for Installation.
- d. Visual (FM 21-60).

★45. COMMUNICATION PROCEDURES

- a. Division Communications.
- b. Radiotelephone Voice Procedure (FM 24-18 and FM 24-20).
- c. Citation of SOI and SSI of Higher Headquarters.

★46. MAINTENANCE RESPONSIBILITIES OF COMMUNICATIONS OFFICER

GREEN
LTC

- Annex A—References (omitted)
B—Reports (omitted)
C—Security
D—Reorganization for Combat
E—CBR and Nuclear Warfare
F—Employment of ADM (omitted) (See FM 5-26)
G—Loading Plan (omitted)
H—Motor Movement
I—Rail Movement
J—Basic Loads (omitted)
K—Evacuation and Hospitalization (omitted)
L—Radio Communication Nets (omitted)
M—Wire Communication Nets (omitted)

OFFICIAL

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ANNEX C (SECURITY) TO SOP,ENGINEER BATTALION

1. GENERAL SECURITY

Policy and Responsibilities.

2. SECURITY DURING MOVEMENT

- a. Air Guards.
- b. Manning of Vehicular Weapons.
- c. Camouflage During Halts.
- d. Advance, Flank, and Rear Guards.
- e. Action in Case of Attack.

(1) Air.

(2) Mechanized.

(3) Nuclear, biological, and chemical.

3. SECURITY IN ASSEMBLY AREA (FM 5-15, FM 5-20, FM 5-31 and FM 61-100).

- a. Camouflage.
- b. Mines and Booby Traps.
- c. Placement of Weapons.
 - (1) Air attack.
 - (2) Mechanized.

- (3) Nuclear, biological, and chemical.
- d. Joint Security.
- e. Security Plans.
- f. Sentry Posts and Outposts.
- 4. REAR-AREA OBSERVATION
 - a. Formation of Rear-Area Observation Groups.
 - b. Selection of Rear-Area Observation Posts.
 - c. Twenty-Four-Hour Manning Posts.
 - d. Observation of Rear Areas When Required.
 - e. Communications for Observation Posts.
- 5. SECURITY OF WORKING PARTIES
 - a. Responsibility.
 - b. Camouflage of Equipment.
 - c. Combat Readiness.
- 6. SECURITY WARNING SIGNALS
 - a. Air Attack.
 - b. Airborne Attack.
 - c. Mechanized Attack.
 - d. Nuclear, Biological and Chemical Attack.
- 7. FIRE SAFETY AND FIREFIGHTING
 - a. Plan (general).
 - b. Fire Personnel and Duties.
 - c. Safety Rules (motor pools, kitchens, and so forth).
- 8. ALERT PLANS
 - a. Unit Plans.
 - b. Alert Roster.

ANNEX D (REORGANIZATION FOR COMBAT) TO SOP,
----- ENGINEER BATTALION

- 1. GENERAL
 - a. Requirement.
 - b. Prior Approval of the Battalion Commander.
- 2. DESIGNATION OF FORWARD ECHELON
 - a. Personnel.
 - b. Equipment.
- 3. DESIGNATION OF REAR ECHELON
 - a. Personnel.
 - b. Equipment.
- 4. SUPPLY
 - a. Ammunition.
 - b. Unit Trains.
- 5. COMMUNICATIONS
- 6. MEDICAL EVACUATION
- 7. STATEMENT OF EFFECT ON REGULAR MISSION

ANNEX E (CBR AND NUCLEAR WARFARE) TO SOP,
----- ENGINEER BATTALION

- 1. GENERAL
 - a. Purpose.
 - b. Subordinate Units to Issue SOP to Conform.
- 2. REFERENCES
 - a. FM 21-40 (other pertinent doctrinal sources).

- b. Division Training Directive No.
- c. Orders, SOP and Annexes.
- 3. ORGANIZATION
 - a. Command and Staff Structure.
 - b. Specialists.
- 4. RESPONSIBILITIES
 - a. Individual.
 - b. Company Commanders.
 - (1) Plans.
 - (2) Proficiency of unit personnel.
 - (3) Safeguarding and processing of captured enemy CBR personnel and equipment.
 - (4) Unit CBR equipment.
 - (5) First-and second-echelon decontamination.
 - c. Large-Scale Decontamination (see Engineer Annex, Div SOP No.).
- 5. DISPERSION
 - Guide to Minimum Distance Maintained Between Various Type Sections.
- 6. CBR ALARMS
 - a. General Alarm. Attack Considered Imminent.
 - b. Actual Attack.
 - c. All Clear.
- 7. PROCEDURE IN CASE OF CBR OR NUCLEAR ATTACK
 - a. Action Prior to Attack.
 - b. Action During Attack.
 - (1) Protective equipment.
 - (2) Cover and movement.
 - ★(3) Resupply of protective equipment and material.
 - (4) Coordination between higher, lower, and adjacent units.
 - ★c. Action After Attack.
 - (1) All clear signal.
 - (2) Continuation of mission.
 - (3) Marking and reporting of contaminated areas.
 - (4) Decontamination.
- 8. PROTECTION
 - a. Individual.
 - b. Unit.
 - c. Tactical.
- 9. SUPPLY
 - a. Emergency Requisitions.
 - b. Authorized Levels of CBR Equipment.
- 10. TRAINING
 - See Division Training Directive No.
 - ANNEX H (MOTOR MOVEMENT) TO SOP,
 - ENGINEER BATTALION
- 1. GENERAL (Division SOP and march orders).
 - a. Preparation of Vehicles.
 - b. Motor Marches.
 - (1) Strip maps.

- (2) Route reconnaissance.
- (3) Messing and refueling.
- (4) Night marches.
- (5) Composition of march units and serials.
- (6) Distances to be maintained.
- (7) Speeds and rate of march.
- (8) Posting of traffic guards during halts.
- c. Conduct of Personnel During Movement.
- d. Maintenance on Marches and Movement.
- 2. VEHICLE AND EQUIPMENT REGULATIONS
 - a. Motor Pool
 - (1) Dispatch.
 - (2) Service.
 - (3) Maintenance.
 - b. Regulations for Administrative Vehicles.

ANNEX I (RAIL MOVEMENT) TO SOP,
-----ENGINEER BATTALION

- 1. ACTION BY S1
 - Troop Lists.
- 2. ACTION BY S2
 - a. Railroad Reconnaissance Report.
 - b. Security.
- 3. ACTION BY S3
 - a. Determine Rolling-Stock Requirements.
 - b. Coordinate Loading Plans.
 - c. Prepare Loading Schedule and Designate Areas.
- 4. ACTION BY S4.
 - a. Initiate Transportation Requests.
 - b. Troop and Guard Mess.
 - c. Procurement of Blocking Materiel and Dunnage.
 - d. Prepare Shipping Documents.
 - e. Movement Policy.
 - f. Designation of Movement Control Personnel.



★ APPENDIX E
MINIMUM POTABILITY STANDARDS
FOR FIELD WATER SUPPLY

SOLOG AGREEMENT 125
 9 SEPTEMBER 1966

UNITED STATES—UNITED KINGDOM—CANADIAN—
 AUSTRALIAN ARMIES
 NON-MATERIEL STANDARDIZATION PROGRAM
 TITLE OF AGREEMENT
 MINIMUM POTABILITY STANDARDS
 FOR FIELD WATER SUPPLY
 DETAILS OF AGREEMENT

1. The Armies of the United States, United Kingdom, Canada, and Australia agree to accept the criteria and standards set forth herein as the minimum potability standard for a safe emergency water supply intended for human consumption under field conditions.

2. Criteria

- a. Short term field water consumption is consumption for 0-7 days.
- b. Long term field water consumption is consumption for periods in excess of seven days.
- c. Total daily consumption per man is considered to be 5 liters (app 1 imperial gallon or 5 U.S. quarts). Under environmental conditions where water consumption substantially exceeds 5 liters per day, the tolerance levels should be proportionately reduced by the commander upon recommendation of his surgeon.
- d. At the individual level the only standards that can be applied are the bacteriological standard and the short term physical standard.
- e. At the unit level short term standards only can be applied.
- f. At Brigade, Combat Group or equivalent and rearward levels the short term standards apply for 0-7 days. Beyond this time frame, the long term standards apply.
- g. Where one of the Armies is unable to meet the standards prescribed herein, the other Armies participating in the agreement will be notified.

3. Source

The water supply shall be obtained from the best available source and shall be rendered safe by acceptable treatment methods.

4. Bacteriological Standards

a. Coliform Count

The most probable number of the coliform group of bacteria shall be less than 1.0 per 100 ml of water. (Short and long term.)

b. Analysis

The method and analysis for coliform bacteria shall be that customary for the cognizant nation.

c. Pollution

The presence of the coliform bacteria, including all organisms of the Coli-Aerogenes Group, shall be considered as indicating water pollution, other than BW Agents.

5. Physical Standards.

a. Turbidity

For short term consumption water shall be reasonably clear. For long term consumption, the turbidity of water shall not exceed 5.0 mgms per liter (silica scale).

b. Taste and Odor

For short term consumption, water should be reasonably free from taste or odor due to hydrogen sulphide, phenols, or other chemical substances. For long term consumption, water should be free from taste or odor due to such substances both before and after disinfection.

6. Chemical Standards

The methods of analysis for the following substances shall be as specified by cognizant nation.

a. Substances for which water must be analyzed as a routine *requirement*.

(1) Short Term Standards

The maximum limits listed below are mandatory for emergency water supply for a period not exceeding seven days. (Asterisked standards are interim pending completion of more exacting studies.)

Arsenic (As)	2.0	mgm/1
Cyanides (incl Cyanogen Chloride)	20.0	mgm/1
Mustard (Sulphur & Nitrogen)	2.0	mgm/1*
Nerve Gas G (A)	0.1	mgm/1*
(B)	0.05	mgm/1*
Nerve Gas (Vx)	0.005	mgm/1*

(2) Long Term Standards

The limits listed below are preferable in water to be used continuously in excess of seven days. (Asterisked standards are interim completion of more exacting studies.)

Arsenic	0.2	mgm/1
Cyanides (incl Cyanogen Chloride)	2.0	mgm/1
Mustard (Sulphur & Nitrogen)	2.0	mgm/1*
Nerve Gas G (A)	0.1	mgm/1*
G (B)	0.05	mgm/1*
Nerve Gas (Vx)	0.005	mgm/1*
Chloride (Cl)	600.0 or	mgm/1
Magnesium (Mg)	150.0	mgm/1
Sulphates (SO ₄)	400.0	mgm/1
Color	50	units
Total Solids	1500.0	mgm/1

7. Radiological Standards (Gross Fission Products)

a. For short term consumption, no absolute numerical standard is recommended or considered necessary. This is based on the conclusion

that, if the external radiation hazard permits occupancy of the water point, the water is suitable for consumption during occupancy not exceeding the one-week period.

b. For long term consumption, available information does not permit the establishment of a practical standard.



FIELD MANUAL }
No. 5-135 }

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., 15 November 1965

ENGINEER BATTALION, ARMORED, INFANTRY, AND INFANTRY (MECHANIZED) DIVISIONS

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This manual supersedes FM 5-135, 30 November 1961.



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CHAPTER 1

INTRODUCTION

1-1. Purpose and Scope

a. This manual provides guidance for commanders, staff officers, and other personnel concerned with the employment of the divisional engineer battalions organic to the infantry, mechanized, and armored divisions.

b. This manual covers the organization, missions, capabilities, training, and operations of the divisional engineer battalions and their components. When used with FM 5-1, which provides basic doctrine governing the activities of engineer troop units in a theater of operations, coverage is in sufficient detail to guide commanders and staffs in the accomplishment of the unit mission. The material presented is applicable without modification to

both limited and general war, either nuclear or nonnuclear, and to cold war or counterinsurgency operations.

1-2. Modification

Users of this manual are encouraged to submit recommended changes or comments to improve it. Comments should be keyed to the specific page, paragraph, and line of the text in which change is recommended. Reasons should be provided for each comment to insure understanding and complete evaluation. Comments should be forwarded directly to the Commanding Officer, U. S. Army Combat Developments Command Engineer Agency, Fort Belvoir, Va. 22060.

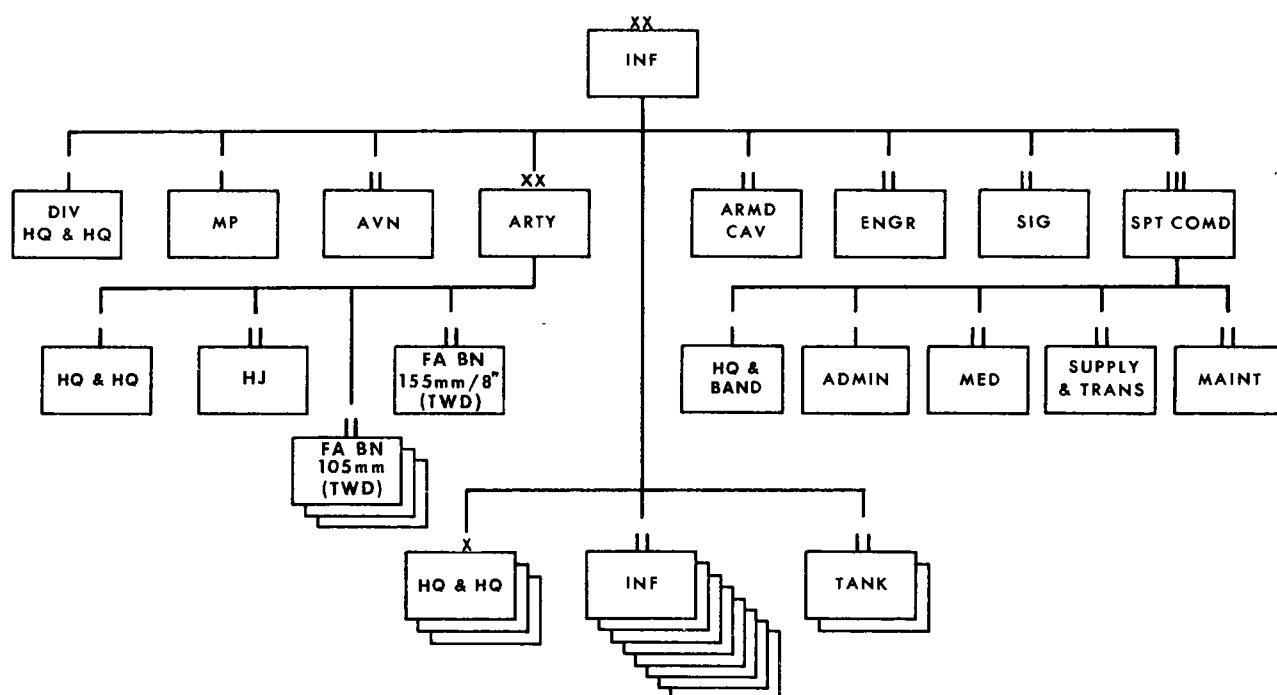


Figure 1-1. Infantry division.

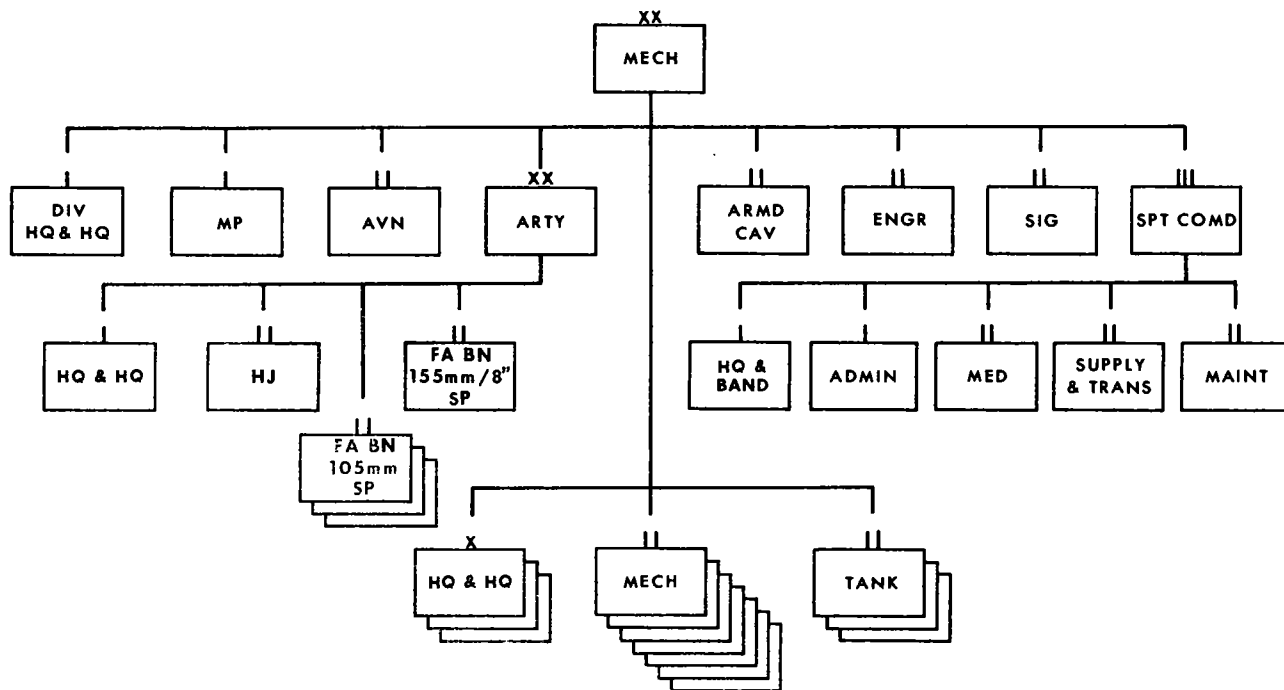


Figure 1-2. Mechanized division.

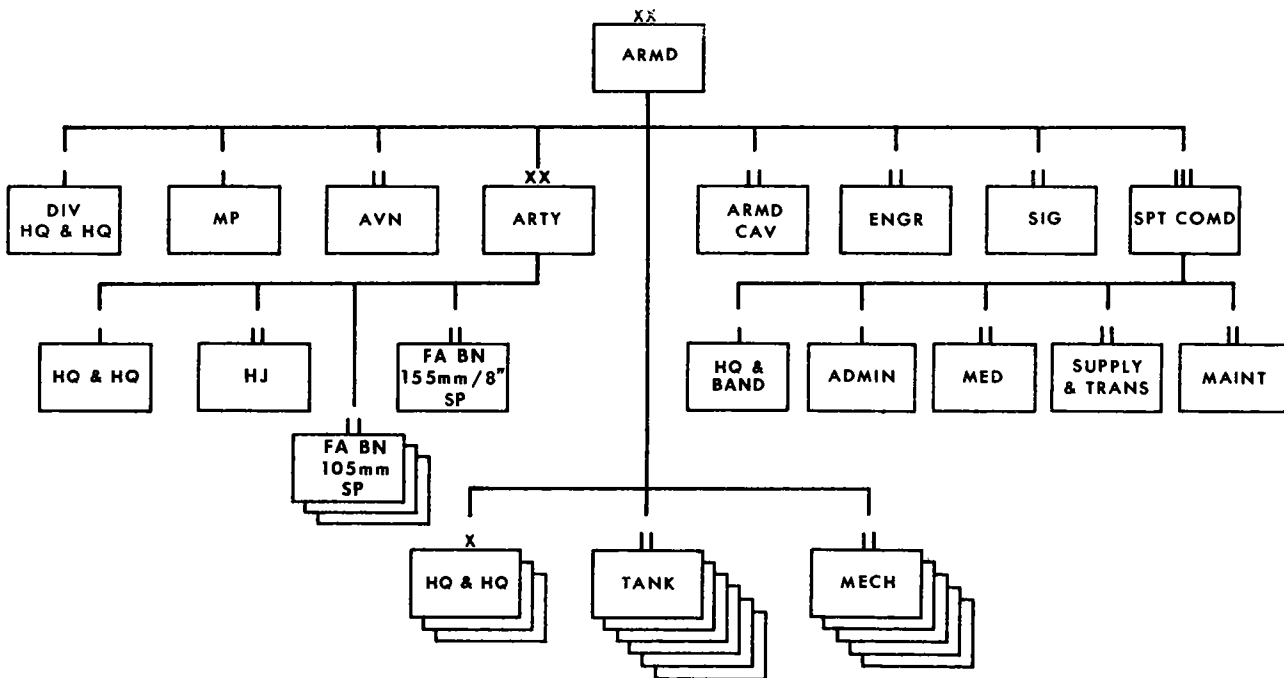


Figure 1-3. Armored division.

CHAPTER 2

DIVISIONAL ENGINEER BATTALIONS

2-1. Organization

The infantry division engineer battalion is organized under TOE 5-155 and the mechanized and armored division engineer battalions are both organized under TOE 5-145. Each consists of a headquarters and headquarters company, four identical combat engineer companies (three at reduced strength), and one bridge company (fig. 2-1).

2-2. Mission

a. To increase the combat effectiveness of the division by performing tasks of construction and destruction to improve the mobility

of friendly forces and to impede the mobility of the enemy.

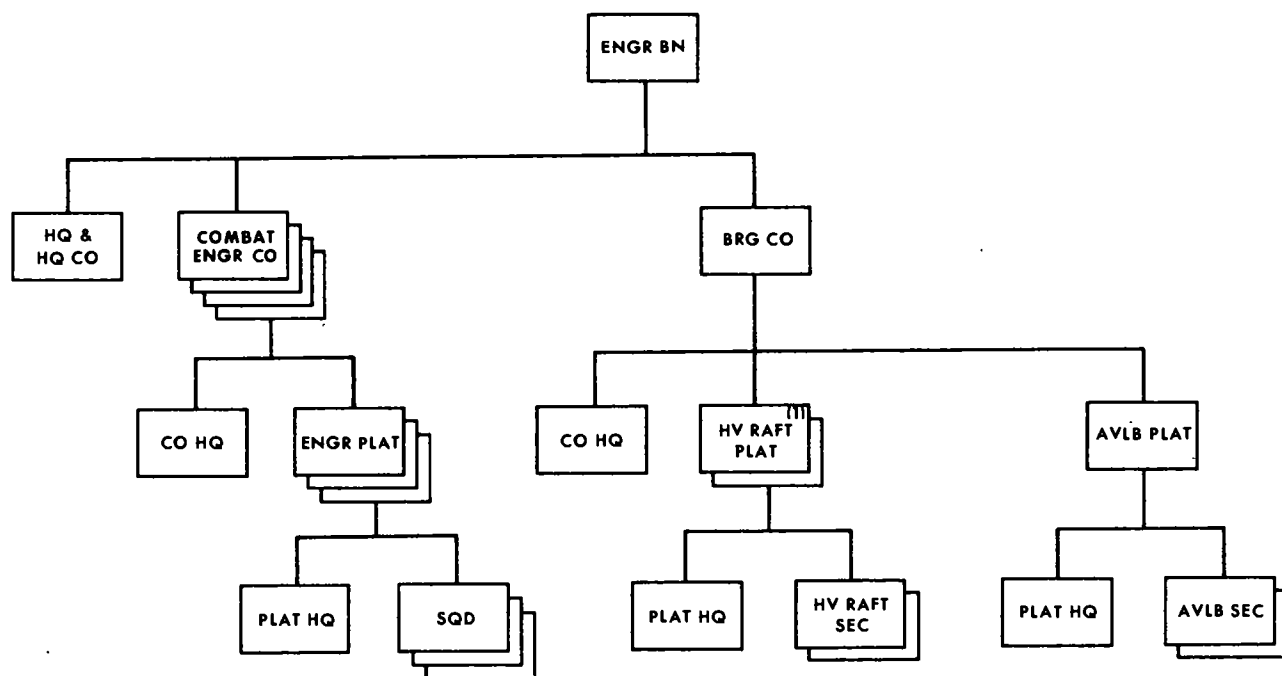
b. To fight as infantry when required.

2-3. Capabilities and Limitations

The divisional engineer battalion has the following capabilities and limitations:

a. *Capabilities.*

- (1) Engineer staff planning for the division.
- (2) Command of organic and attached engineer troops.
- (3) Construction, repair, and maintenance.



1. The bridge company may be organized with two bridge platoons in place of the heavy raft platoons. Each bridge platoon has a platoon headquarters and two bridge sections.

Figure 2-1. Organizational chart, divisional engineer battalion.

nance of roads, bridges, fords, and culverts.

- (4) Support of hasty and deliberate stream crossing operations with boats, rafts, and bridges; coordination of organic and attached engineer troops in support of deliberate stream crossings.
- (5) Construction of bridging for passage of short gaps.
- (6) Emplacement and removal of obstacles, including mines and booby-traps.
- (7) Preparation and execution of demolitions including atomic demolition munitions (ADM).
- (8) Performance of engineer reconnaissance and intelligence missions.
- (9) General construction, including construction of airfield and heliports.
- (10) Water purification.
- (11) Providing specialized equipment and personnel to facilitate the assault of fortified positions.
- (12) Technical assistance to other troops of the division in construction of obstacles, fortifications, emplacements, camouflage, deception devices, and other engineer matters, including recommendations for employment of engineer troops. Construction of these facilities when required.
- (13) Organizational maintenance of equipment organic to the battalion.
- (14) Performing missions in support of counterinsurgency operations.
- (15) Fight as infantry when required.

b. Limitations.

- (1) Has a limited capacity for earthmoving and requires equipment and personnel support for projects involving considerable earth-work.
- (2) When assigned an infantry combat role, requires fire support (mortars and artillery), forward observers, and time to reorganize for combat.

2-4. Equipment

The divisional engineer battalion is equipped with the weapons, construction equipment, handtools, power tools, bridging, and other equipment that will enable it to accomplish day-to-day engineer missions in support of the division. In situations where the battalion lacks the means to provide the engineer support required by the division, the next higher command echelon provides additional equipment or additional engineer units to accomplish the mission. The applicable TOE should be consulted to determine the amount and types of equipment authorized in the various units of the battalions. Frequently, a theater commander or other major commander authorizes additions to or deletions from the equipment of organizations under his command; therefore, the equipment may vary from command to command. Army aviation support for the engineer battalion is provided by the aviation battalion of the division or higher command echelons. Engineer companies receive army aviation support from the supported unit or the division aviation battalion.

2-5. Employment

a. The engineer battalion is a self-contained unit designed to provide engineer combat support in the forward portion of the battle area. It has the ability to overcome a great variety of obstacles to the movement of the division and hence contributes to the mobility of the division and its capability to maneuver in offensive action. In defense, retrograde, or denial operations, it has the capability to materially impede the progress of enemy ground operations by blocking critical avenues of approach.

b. The battalion's combat engineer companies are placed in direct support of or attached to the brigades and combat elements of the division. The headquarters company and the bridge company contain engineer construction equipment and stream crossing equipment with operators and specialists to supplement the combat engineer companies for specific tasks.

c. Combat engineer companies may be associated with particular brigades so as to increase operational efficiency. The company commander serves as the engineer staff officer of the brigade.

d. When placed in direct support of a brigade, the combat engineer company is employed under centralized control of the engineer battalion. It may be attached to a brigade for specific operations or when centralized battalion control is impracticable. Platoons are placed in direct support of, or attached to, battalion task force units for specific missions.

e. Engineer teams of less than platoon size normally are attached to combat elements. This is necessary when specific tasks require close command control. In the offensive, such tasks may consist of bridging, obstacle breaching, or trail cutting. In defense or retrograde, the installation of barriers and the employment of ADM may require mission-type attachment.

f. Engineer troops engage in limited combat incident to accomplishment of their normal missions. Early relief of engineer elements is made by other combat elements to permit continuation of engineer missions. The division commander will engage the engineer battalion in sustained ground combat when the exigencies of the situation so require their employment. It is desirable to preserve unit integrity. Fire support, forward observers, and time to reorganize for combat are essential (ch 8).

g. When the armored cavalry squadron or task organizations are committed on separate missions, an appropriate engineer element is attached to the force. Attached engineers should be mounted in vehicles similar in type to those of the supported force to insure the same tactical mobility.

h. Special requirements for engineer effort should be considered when planning for airborne or airmobile operations. Engineer support may be required at loading areas and access routes thereto. The extent of engineer effort that is or will be required at landing/drop zones also must be considered so that sufficient engineers and engineer equipment are provided.

i. When the requirement for engineer support within the division exceeds the capability of the divisional engineer battalion, additional engineer support is provided by the next higher echelon of command.

- (1) The additional engineer support to the division may range from reinforcement of the combat engineer strength to the provision of such support as bridging, road construction, debris removal, erection of barriers, mapping and other engineer intelligence, survey, camouflage, and deception.
- (2) Nondivisional engineer units normally are placed in support of the division. However, engineer units are attached when their missions necessitate close command control in execution. River crossing missions, barrier demolition tasks, or use of ADM are examples of such situations. All engineer combat support provided to the division is coordinated by the division engineer.

2-6. Mobility

The divisional engineer battalion is 100 percent mobile with organic transportation. It is 90 percent air transportable in 50,000 pound lift aircraft in Phase III of an airborne operation.



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CHAPTER 3

HEADQUARTERS AND HEADQUARTERS COMPANY

3-1. Organization

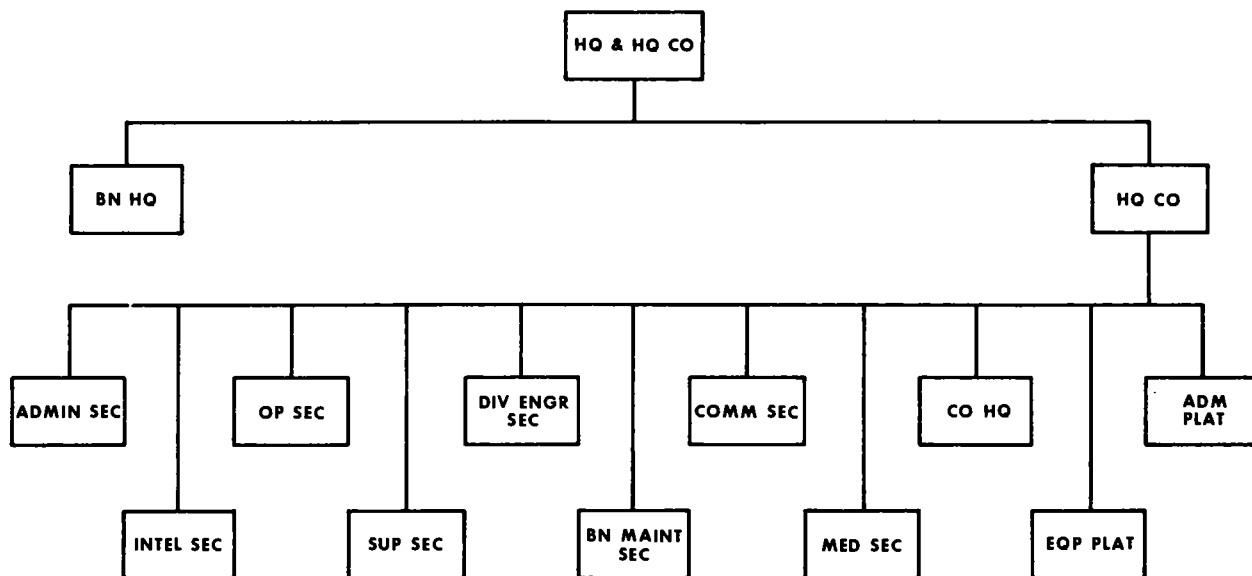
Headquarters and headquarters company of the infantry divisional engineer battalion is organized under TOE 5-156; that of the armored and mechanized divisional engineer battalions under TOE 5-146. The three units are similarly organized (fig. 3-1) and each consists of two elements; a battalion headquarters and a headquarters company.

a. Battalion Headquarters. The battalion headquarters consists of—

- (1) Battalion commander (also division engineer).
- (2) Executive officer.

- (3) Assistant division engineer.
- (4) S1.
- (5) S2.
- (6) S3.
- (7) S4.
- (8) Engineer equipment officer.
- (9) Surgeon.
- (10) Chaplain.
- (11) Communications officer.
- (12) Sergeant major.

b. Headquarters Company. Headquarters company consists of a company headquarters, an equipment platoon, an ADM platoon, and the personnel of the following battalion headquarters sections:



NOTE: This chart portrays the source and distribution of personnel in headquarters and headquarters company. It is not a chain of command chart.

Figure 3-1. Headquarters and headquarters company, divisional engineer battalion.

- (1) Administration.
- (2) Operations.
- (3) Intelligence.
- (4) Supply.
- (5) Division engineer.
- (6) Communications.
- (7) Maintenance.
- (8) Medical.

3-2. Duties and Functions

The duties of the battalion commander and his staff and the functions of the staff sections are as discussed in FM 5-1 and FM 101-5 and AR 600-20, AR 611-101, AR 611-112, and AR 611-202.

3-3. Capabilities

a. Headquarters and headquarters company provides—

- (1) Staff planning of division engineer operations and supervision of organic and attached engineer troops.
- (2) Potable water for the division through the operation of up to five water points.
- (3) Engineer reconnaissance and intelligence for the engineer battalion and the division.
- (4) Limited ADM support to the division. This capability may be increased by the attachment of TOE 5-500 ADM teams.
- (5) Unit level medical service for the battalion, to include medical care and evacuation, establishment of a battalion aid station, and furnishing aidmen to companies.
- (6) Supplemental construction equipment and operators to elements of the battalion.
- (7) Organizational maintenance and repair service for battalion equipment.
- (8) Radio and wire communications for the battalion.

b. Individuals of this company can fight as infantrymen, when required. The company has the capability of defending itself and its installations against hostile ground attack.

c. When the battalion is committed to a combat role, headquarters and headquarters company functions as an infantry, infantry (mechanized) or armored infantry battalion headquarters (ch 8).

3-4. Equipment

Major items of equipment in headquarters and headquarters company include—

- a. Truck mounted, 1,500 gph, water purification sets.
- b. 20T, $\frac{3}{4}$ cu yd, crane shovels.
- c. Graders.
- d. Tractor dozers.
- e. Pneumatic tool and compressor outfit.
- f. 5-T dump trucks.
- g. $2\frac{1}{2}$ - and $\frac{3}{4}$ -T cargo trucks.
- h. Generator sets, 1.5 to 10 KW.

3-5. Operation

The battalion commander organizes and locates his headquarters in a manner best suited for carrying out his staff and command functions.

a. *Location.* In addition to other considerations, the headquarters is located to facilitate communication with the division command post, subordinate units, the support command, and other supporting engineer units. The situation or the disposition of the division dictates the organization and operation of the headquarters in one, two, or three echelons. Fragmentation of the headquarters to the extent of impairing effective operation is avoided.

b. *Echelons.* Figures 3-2 and 3-3 depict a suggested organization and location of headquarters for operations in two and three echelons respectively. The battalion commander may organize his headquarters in two echelons when frequent moves are anticipated, to achieve dispersion, to improve communications and control, or to stay in close touch with an operation such as a river crossing. In any of these situations, the commander retains in the forward echelon the staff officers and other personnel required to assist him in fulfilling his

command and staff responsibilities. In a fast-moving situation, the battalion commander may be operating with the division commander and his command group in the division tactical command post. In such a situation, he may or-

ganize the entire headquarters into three echelons to facilitate control and movement.

c. Layout. The battalion command post (CP) is laid out to facilitate security, dispersion, communications, concealment, movement to and

ENGR BN, FORWARD	ENGR BN, REAR
BN CO BN XO ADE(at Div Main CP) S1 S2 RECON OFFICERS S3 & ASST S3 COMM OFFICER SURGEON CHAPLAIN HQ Co CO ADM PLAT LEADER SMAJ CML NCO	S4(Responsible for operation of BN, REAR) UNIT SUPPLY TECHNICIAN ENGR EQUIP OFFICER ENGR EQUIP REPAIR TECHNICIAN HQ Co XO LIAISON OFFICER EQUIP PLAT LEADER COMM NCO
NOTE: Battalion forward is located near division main. Battalion rear is generally located near support command. All personnel and equipment not needed for the operation of the forward echelon remain with rear echelon.	

Figure 3-2. Organization of battalion headquarters in two echelons.

ENGR BN COMD GP	ENGR BN, FORWARD	ENGR BN, REAR
BN CO S2 S3 RECON OFFICERS COMM OFFICER	BN XO ADE(at Div Main CP) S1 ASST S3 SURGEON CHAPLAIN HQ Co CO ADM PLAT LEADER SMAJ CML NCO COMM NCO	S4 UNIT SUPPLY TECHNICIAN ENGR EQUIP OFFICER ENGR EQUIP REPAIR TECHNICIAN HQ Co XO LIAISON OFFICER EQUIP PLAT LEADER

Figure 3-3. Organization of battalion headquarters in three echelons.

from the area, and movement within the area. Figure 3-4 illustrates a layout when the CP is in one echelon. The assistant division engineer

(ADE) is located in the tactical operations center (TOC) at the division main command post.

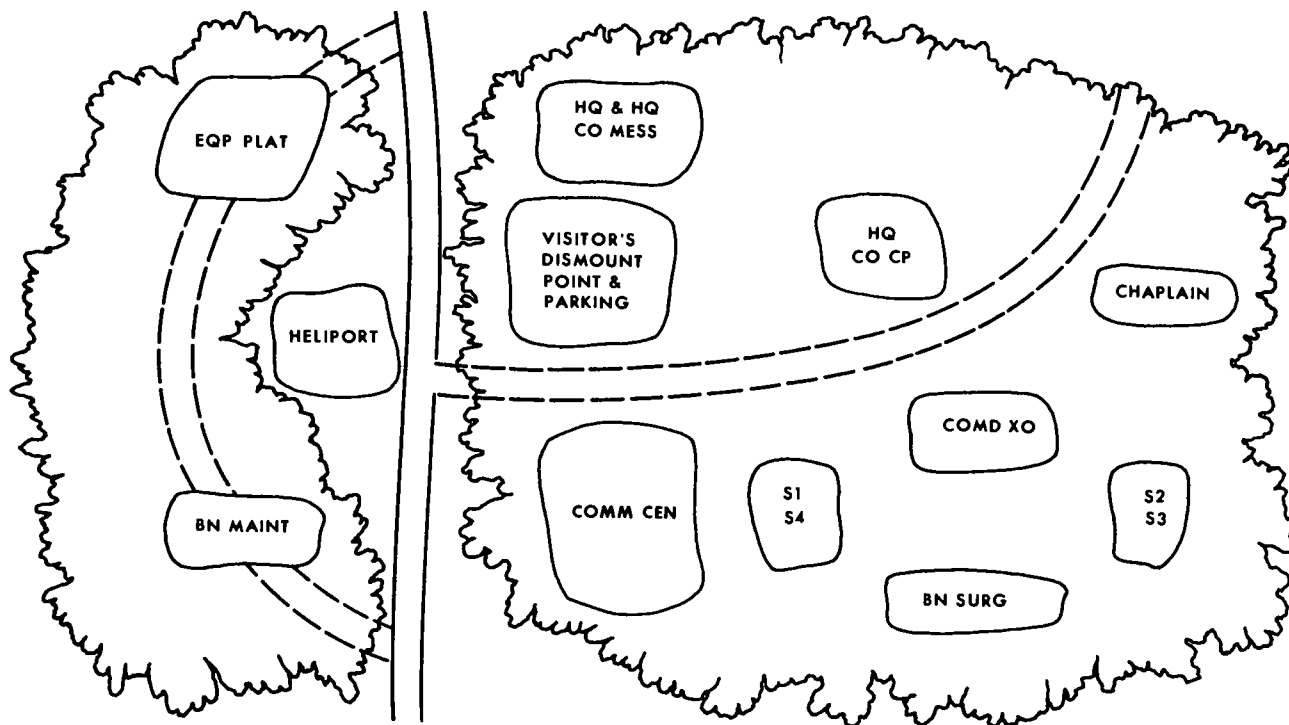


Figure 3-4. Battalion command post layout—one echelon.

CHAPTER 4

COMBAT ENGINEER COMPANY

4-1. Organization

The combat engineer company is the basic operating component of the divisional engineer battalion. The combat engineer company of the infantry division engineer battalion is organized under TOE 5-157 and those of the mechanized and armored division engineer battalions are organized under TOE 5-147. Each is organized into a company headquarters and three identical engineer platoons, each platoon consisting of a platoon headquarters and three engineer squads (fig. 2-1). Because of the difference in the mobility of the infantry division as compared with the mechanized and armored divisions, there are some differences in equipment and personnel of the engineer companies, principally in the squad vehicle.

4-2. Mission

a. The combat engineer company is equipped and trained to fulfill its mission of increasing the combat effectiveness of major subordinate combat formations by means of general and special engineer work. It performs the tactical engineer staff planning, supervision, and execution of the engineer combat support mission at brigade or task force level. It also undertakes and carries out combat missions when required.

b. The platoon is the principal working component of the combat engineer company and generally operates as a major element of the company. It can also operate independently to provide the engineer support normally required by a battalion task force when it is furnished equipment support by its parent company or the battalion.

c. The squad is the basic operating and working unit of the platoon. It consists of specialists in combat construction and demolition and en-

gineer soldiers who are trained to assist in accomplishing combat engineer tasks. In the mechanized and armored divisional engineer battalions, the squad personnel and organic equipment are mounted in an armored personnel carrier, giving the squad cross-country mobility. In the infantry division engineer battalion, the squad personnel and organic equipment are mounted in dump trucks.

4-3. Capabilities

The engineer company is capable of the following:

a. Performing combat engineer tasks, including repair and maintenance of roads, bridges, ferries, fords, and culverts. When augmented with additional engineer heavy equipment, it can execute more complex tasks such as the construction of roads and airlanding facilities.

b. Emplacing and removing obstacles, including mines and boobytraps; and assisting other troops in these tasks as required.

c. Construction and operation of rafts and bridges in river crossing operations.

d. Preparing and executing demolitions, including assistance in the emplacement of atomic demolition munitions.

e. Assisting other troops in the construction and emplacement of fortifications, camouflage, and deceptive devices.

f. Assisting in the assault of fortified positions.

g. Conducting engineer reconnaissance.

h. Providing technical advice to supported organizations on engineer matters. This includes recommendations for employment of engineer troops.

4-4. Equipment

The major items of equipment in each company are listed in table 4-1.

Table 4-1. Major items of company equipment

Element	Item	Engr Co. Inf Div Engr Bn	Engr Co Mech or Armed Div Engr Bn
CO Hq	Armored personnel carrier (APC) -----		X
	Combat engineer vehicle (CEV) -----	X	X
	Pneumatic tool and air compressor outfit, tlr mtd -----	X	X
	Carpenter tool kit, squad -----	X	X
	Tractor w/semi-U dozer -----	X	X
	Truck, cargo, 2½-ton -----	X	X
	Truck, dump, 5-ton -----	X	X
Plat Hq	Chain saw -----		X
	Electric pioneer tool outfit -----	X	X
	Scoop loader -----	X	X
	Truck, dump, 5-ton -----	X	X
	Carpenter tool kit, platoon -----	X	X
Each Sqd	Pioneer tool kit, platoon -----	X	X
	Demolition equipment set -----	X	X
	Armored personnel carrier -----		X
	Chain saw -----	X	
	Carpenter tool kit, squad -----	X	X
	Pioneer tool kit, squad -----	X	X
	Truck, dump, 5-ton -----	X	
	Demolition equipment set -----	X	X
	Detecting set, mine, metallic -----	X	X

4-5. Employment

a. The engineer company with organic equipment is designed to provide combat engineer support to a brigade or brigade-size task force engaged in combat operations. It is reinforced with general or special engineer equipment from the headquarters company or bridge company when necessary to increase the effectiveness of the support rendered.

b. The company normally is employed as a unit in a direct support role but it may be attached to a major subordinate combat formation for separate operations. One reinforced engineer company normally supports each committed brigade or similar size task force.

c. The engineer company supporting a unit in offensive operations should be placed well forward in the tactical column in order that it may be available for essential engineer tasks.

A typical disposition would be the engineer platoons, with assault bridging, located immediately to the rear of the leading companies in the task force. The company minus would be located in the vicinity of the brigade or task force command post (CP). The company commander of the engineer company supporting a combat formation acts as unit engineer on the staff of the force commander.

d. Each of the three platoons of the company is capable of performing combat engineer support tasks including earthmoving, demolitions, and pioneering. The platoon capability for support of armored operations is built around the armored vehicles. When reinforced with the assault bridge and a combat engineer vehicle, the platoon may be used to support armored task forces under fire. When reinforced with a dozer, graders, dump trucks, and an air compressor, the platoon supports defensive operations or performs general engineer work.

e. The platoon usually is employed as a part of the company but it may be given a mission in direct support of a battalion-size task force. The platoon leader of the supporting engineer platoon is the engineer staff officer for the supporting task force.

f. Because of the limited capability of the squad, it usually is employed as a working component of the platoon. There are times, however, when the squad may be given an independent mission.

4-6. The Combat Engineer Vehicle (CEV)

The CEV (fig. 4-1) is one of the most important items of mission equipment of the combat engineer company.

a. *Capabilities.* The CEV provides engineer troops in the forward combat area an armor-protected means of accomplishing pioneer tasks under hostile fire in support of combat elements. Typical tasks which may be assigned to the CEV are—

- (1) Destruction or removal of obstacles by use of the demolition gun, bulldozer, winch, or boom.
- (2) Construction of roadblocks and other

obstacles by use of the bulldozer, winch, or boom.

- (3) Passage of short dry gaps, antitank ditches, and craters by earthfilling using the bulldozer.
- (4) Placement of fixed span assault bridging or fascines for passage of short gaps.
- (5) Preparation of abutments for the armored vehicle launched bridge (AVLB).
- (6) Removal of barbed wire entanglements by dozing or running over the wire obstacle.
- (7) Construction of approaches and entry and exit points for mobile floating assault bridge equipment (MAB) and amphibious vehicles.
- (8) Construction of combat roads and trails.
- (9) Destruction of strong points in the

assault of fortified areas or in combat in built-up areas.

- (10) Clearance of rubble and debris in built-up areas to permit passage of other combat vehicles.
- (11) Construction of tank and gun emplacements.
- (12) Launching explosive mine clearing devices in the assault breaching of minefields.

b. Limitations. Although the CEV is a heavily armored vehicle and carries a 165-mm demolition gun, it is designed for use as a combat support vehicle, not as a tank. When employed in forward areas subject to enemy tank or antitank fire, it requires protection by tanks or other antitank weapons. The crew of the CEV is trained to utilize the vehicle in combat construction and demolition tasks, not in armor tactics. The CEV should be used only for those combat engineer tasks required to support assault elements.

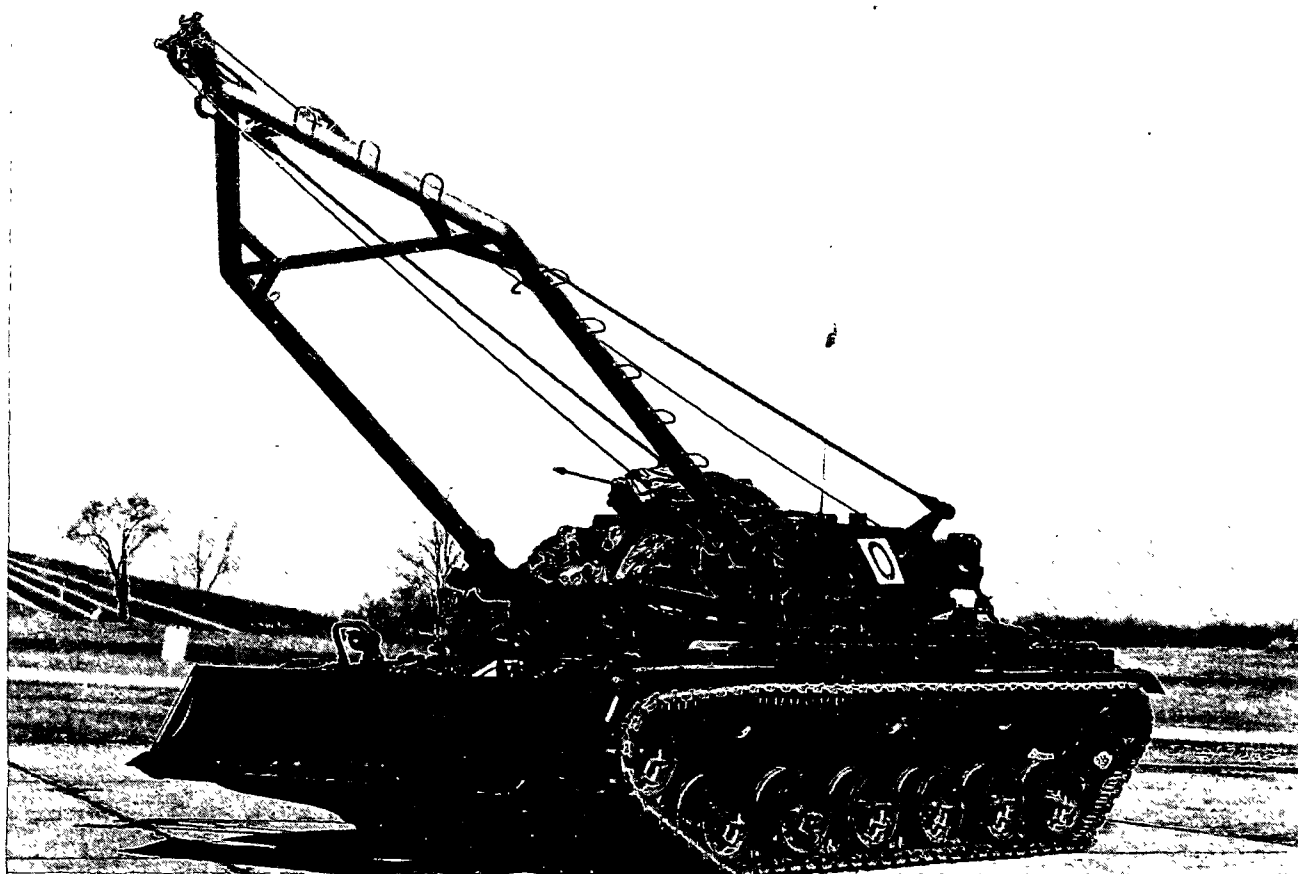


Figure 4-1. Combat engineer vehicle; $\frac{3}{4}$ left side view.



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CHAPTER 5

BRIDGE COMPANY

5-1. Organization

The bridge company of the divisional engineer battalion is organized under TOE 5-148 and is the same for the armored, mechanized, and infantry divisions. It consists of a company headquarters, an armored vehicle launched bridge (AVLB) platoon, and either two identical heavy raft platoons (mobile floating assault bridge/ferry equipment (MAB)) or two identical bridge platoons (M4T6 or Class 60 bridging) (fig. 2-1).

5-2. Mission

The mission of the divisional engineer bridge company is to—

a. Increase the effectiveness of division engineer companies by providing equipment and technical personnel to load, maintain, transport, erect, and operate tactical assault stream crossing equipment.

b. Engage in nontactical independent bridging or ferry missions, when required, using its organic equipment.



Figure 5-1. One hundred meter MAB erected in 15 minutes by 36 men.

c. Undertake and carry out limited combat missions when required.

5-3. Capabilities

The divisional engineer bridge company has the following capabilities:

a. Providing heavy float bridging.

(1) When equipped with mobile floating assault bridge/ferry (MAB) equipment.

(a) One class 60 float bridge up to 149 meters long (fig. 5-1) or,

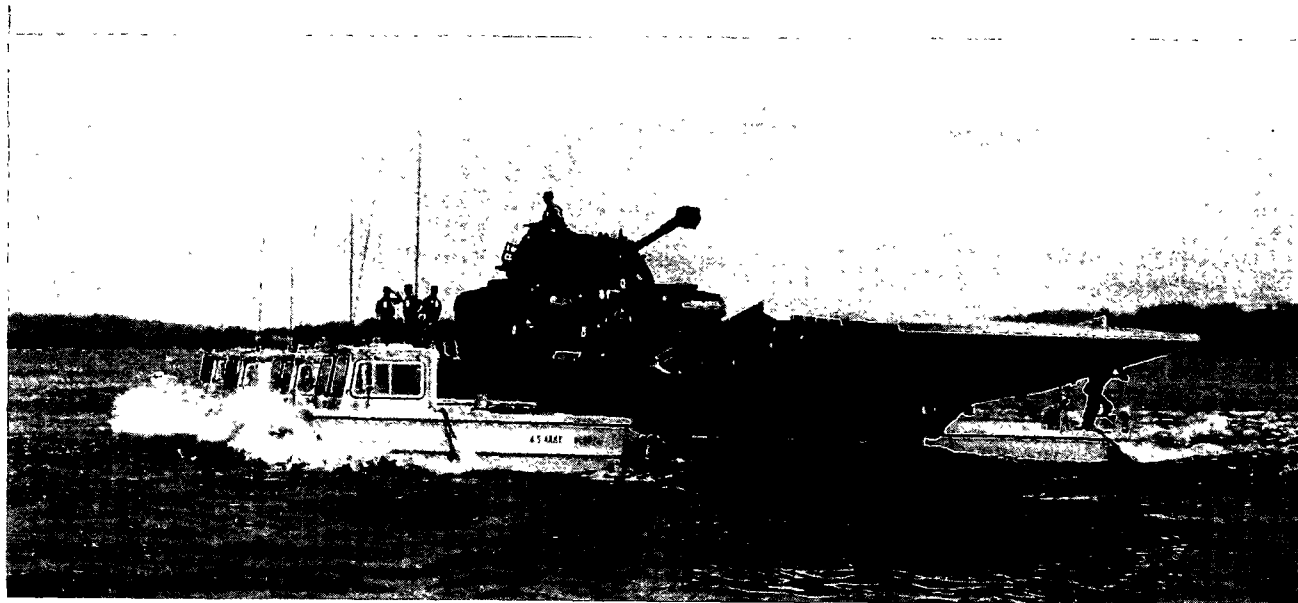


Figure 5-2. M48 tank on MAB ferry.

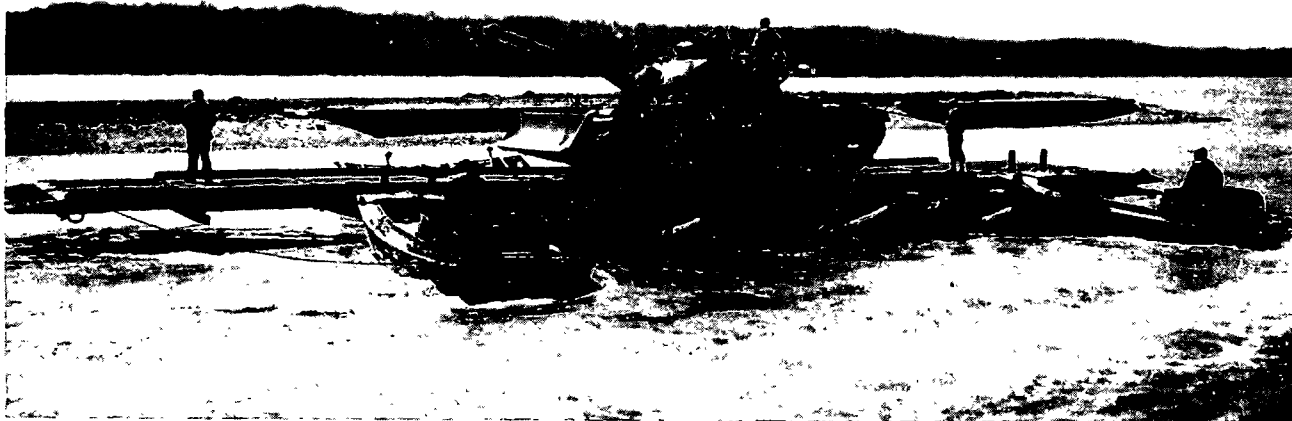


Figure 5-3. Four-float M4T6 (class 50) raft, propelled by two 27-foot bridge erection boats.



Figure 5-4. Class 60 raft propelled by two 27-foot bridge erection boats.

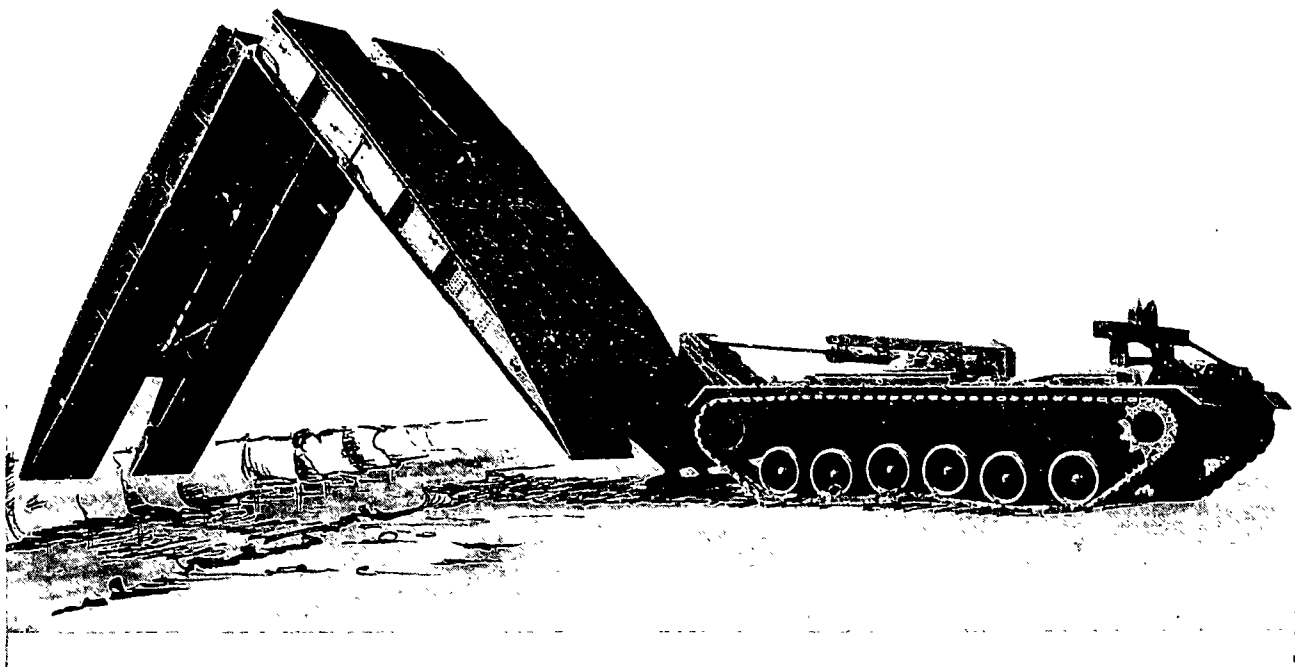


Figure 5-5. Armored vehicle launched bridge being erected.

- (b) Two class 60 float bridges each up to 85 meters long or,
- (c) Four class 60, self-propelled ferries (fig. 5-2).
- (2) When equipped with M4T6 bridge equipment.
 - (a) Class 50 floating bridge up to 170 meters long or,
 - (b) Eight class 50 rafts (fig. 5-3) or,
 - (c) Short fixed spans from 4.5 to 13.7 meters long.
- (3) When equipped with class 60 bridge equipment.
 - (a) Up to 164 meters of class 60 floating bridge or,
 - (b) Four class 60 rafts (fig. 5-4).
 - (c) Short fixed spans from 7 to 18 meters long.

b. Providing armored vehicle launched bridging capable of crossing class 60 loads over wet or dry gaps up to 18 meters wide (fig. 5-5).

c. Providing light stream crossing equipment as follows:

- (1) Eighteen pneumatic assault boats to cross one infantry company.
- (2) Light tactical raft sets to provide—
 - (a) Two 4-ponton, 3-bay rafts, class 12 in currents up to $2\frac{1}{2}$ meters per second (fig. 5-6), or
 - (b) Up to 34.8 meters of floating bridge, class 11 in currents up to $2\frac{1}{2}$ meters per second, or
 - (c) Eight pontoons powered by outboard motors to be used as storm boats for an assault crossing of an infantry company.



Figure 5-6. Light tactical raft powered by four outboard motors.

d. Providing organizational maintenance for its organic vehicles and engineer equipment.

e. Defending itself and its installations against ground attack to a limited extent.

5-4. Mobility

The bridge company is 100 percent mobile in organic transportation.

5-5. Equipment

The bridge company contains the major items of equipment listed below.

a. Mobile floating assault bridge/ferry, or floating bridge, M4T6, or floating bridge, class 60.

b. Armored vehicle launched bridges and launchers.

c. Assault boats.

d. Floating bridge, light tactical raft.

e. Outboard motors.

f. Bridge erection boats, when equipped with the M4T6 or the class 60 floating bridge.

g. Crane shovel, truck mounted.

h. Tractor with dozer.

i. Radios.

j. Semitrailers, 60- and 25-ton.

k. Bridge trucks, 5-ton.

l. Truck tractors, 10-ton.

m. Cargo trucks, $\frac{3}{4}$ - and $2\frac{1}{2}$ -ton.

5-6. Employment

a. *General.* The engineer bridge company is designed to provide wet and dry gap crossing equipment and technical personnel to the combat engineer companies of the battalion in support of brigade or task force operations. Normally, platoons or sections of platoons are attached to the combat engineer companies. However, gap crossing problems are varied, and each situation requires suitable tailoring of the support element.

b. *Employment of the AVLB.* In addition to the AVLB's of the engineer battalion, each tank battalion has two bridges and launchers. For details of armor employment of the bridge

see FM 17-1. The armored vehicle launched bridge is employed primarily in assault crossings of short gaps by combined arms teams. It is particularly suitable for spanning narrow streams, antitank ditches, craters, canals, partially blown bridges, and similar obstacles which normally would slow the momentum of attack. The AVLB may be placed over existing bridges or portions of existing bridges to increase the load-carrying capacity of these bridges. It may also be used with components of the class 60 bridge to rapidly construct rafts. In instances where the flank of friendly forces is on a narrow stream or defile, the assault bridge may be used in making a flanking movement. The AVLB should be left in place across the gap only as long as it is needed. It may be left in place to permit the crossing of units following the assault elements, or to provide routes for subsequent logistical or other tactical movement. In this event, an assembled assault bridge from the AVLB platoon is brought forward and placed on the launcher. The launcher then moves to rejoin the supported assault unit. Assault bridging which has been left in place becomes the responsibility of corps or army engineers. The decision to leave the assault bridge in place rests with the crossing force commander, who normally coordinates with the division commander and the division engineer. The division engineer arranges transfer of responsibility with appropriate engineer units. Resupply of AVLB's to the engineer battalion and to tank battalions is the responsibility of the division support command.

c. *Employment of Floating Equipage.* The divisional engineer battalion can support the river-crossing needs of the division only for small-scale operations. Normally, the division engineers are needed to support the assault units on the far shore, and corps engineer units, attached to, or in support of the division, construct and operate the necessary heavy vehicular bridges and rafts. The divisional bridge company's floating equipage normally is used in the assault and division engineers are given riverline missions which would release them as soon as possible to their normal far shore tasks.



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CHAPTER 6

OFFENSIVE OPERATIONS

Section I. INTRODUCTION

6-1. The Engineers in the Offense

a. This chapter provides guidance for employment of the divisional engineer battalion and attached engineer units in support of offensive combat. The engineer battalions organic to the infantry, mechanized, and armored divisions operate in like fashion modified by the nature and activities of the combat forces of which they are a part. Engineer units may be placed in direct support of, or attached to, brigades or task forces in the offense, although some situations may require centralized control of all engineer effort at division level. When early commitment of the reserve is anticipated, appropriate engineer support must be provided.

b. Because of the varied combinations within each division of tank-heavy, infantry-heavy, or balanced brigades, elements of the engineer battalion must be tailored to best support each brigade or task force. This tailoring is dependent on the mission, actual or potential obstacles, and composition of the combat formation.

c. Offensive operations are those undertaken to carry the battle to the enemy. The purpose of the offense is to destroy enemy forces, to deprive the enemy of required resources, to seize territory or terrain, to develop enemy dispositions, or to divert the enemy's attention from other areas. The basic forms of offensive maneuver are the penetration and the envelopment. The frontal attack is a variation of the penetration: a double envelopment and a turning movement are variations of the envelopment. The distinction in the division form of maneuver exists primarily in the intent of the division commander since the sub-

ordinate elements of the division may use all the forms of maneuver in the attack. Infiltration is a technique of movement used in conjunction with the several forms of maneuver. The exploitation is an offensive operation which may follow a successful penetration or envelopment. The pursuit is an extension of a successful exploitation.

d. A movement to contact may be required to place the division in position to close with the enemy. It may take place during the period between the loss of enemy contact and the time it is regained (as in a pursuit or exploitation) or when the division moves from a rear area to engage the enemy.

e. An additional objective from the friendly force during the advance is to gain an advantage over the enemy that will facilitate future operations. Maximum advantage of position at the time of contact is achieved by properly organizing the force for combat and maneuvering the force components. During the advance the division commander distributes his forces to provide maximum speed and control consistent with adequate security. The movement to contact is conducted generally on a broad front, usually in multiple columns. The advance is pushed forward aggressively to gain the objective before the enemy can react.

f. The movement to contact terminates when major enemy resistance requires the deployment and coordinated effort of the division. For additional details on the movement to contact, see FM 61-100.

g. The coordinated attack of the division is characterized by fire and maneuver, which are combined and controlled to create a prepon-

derance of combat power that culminates in a powerful and violent assault in the decisive area.

h. Once the attack is launched, the division attempts to gain its objective in the shortest possible time. To insure rapid execution, the commander exploits all means of combat power.

6-2. Engineer Effort, Assistance, and Control

a. Economy of Engineer Effort. There are seldom enough engineer troops available to accomplish all the pioneer work necessary to assist the advance of the combat arms and their supporting elements. To insure that maximum engineer effort is available for those tasks which require engineer skills and equipment, troops of combat arms and services participate as required in such pioneer tasks as:

- (1) Expedients for stream crossings.
- (2) Preparation of protective obstacles and deception devices.
- (3) Minefield laying and breaching.
- (4) Expedient road and culvert repair.
- (5) Execution of camouflage projects.
- (6) Reduction of obstacles.
- (7) Control of fires in forested or built-up areas.

b. Typical Engineer Tasks. The division engineer recommends the disposition of engineer troops for each operation. Such disposition normally is made by assigning engineers specific tasks such as—

- (1) Conducting engineer reconnaissance.
- (2) Locating, marking, and removing mines.
- (3) Assisting forward movement of the combat arms and supporting elements by repairing roads, removing obstacles, and helping them cross gaps, streams, rivers, and passage through defiles.
- (4) Constructing airlanding facilities for troop movements, supply and evacuation.
- (5) Opening and improving roads, trails, bridges, and fords for troop movement, supply and evacuation.

- (6) Providing route information necessary for the preparation of traffic circulation plans and implementing engineer requirements developed by the plans.
- (7) Assisting in flank security through the use of demolitions, minefields, and obstacles.
- (8) Providing engineer intelligence data.
- (9) Providing potable water.

c. Assistance to Divisional Engineers. The corps commander allocates support to the division, including engineer units, based upon the overall corps mission and situation. At the beginning of an offensive operation, a corps engineer combat group may assume some of the divisional engineer battalion's responsibilities in the division rear area, progressively extending its work line forward to relieve the divisional battalion. Elements of a corps engineer combat group or the entire group may be attached to a division for an operation requiring an unusual amount of engineer support; for example, a river crossing. The attached engineer units return to the control of the parent unit at the conclusion of the operation. In a major attack, the corps engineer combat group may designate one or more of its combat battalions as direct support battalions, operating with the division and often in the same areas as elements of the divisional engineer battalion. Such units remain under group control. Except for special operations, it normally is desirable for corps engineer units, under parent unit control, to support the division on an area basis. Boundaries between the divisional and corps engineer units are established informally to denote the forward working limit of the supporting engineer unit. Such working limits eliminate unnecessary concentration of nondivisional troops in forward areas. Specific missions forward of a working limit, such as bridge or road construction and maintenance, are made on a task basis. The size of the engineer elements attached or supporting is governed by the anticipated strength necessary to reduce obstacles and to support the advance of the attacking forces. When necessary, nondivisional engineers may be further attached to

brigades. Regardless of the seniority of supporting engineer unit commanders, the commander of the divisional engineer battalion remains the division engineer and directs the engineer work in the division area through liaison with the supporting units or through recommendations to the division commander.

d. Control. It is essential that the engineers be in close contact with the committed units. Proximity enables them to anticipate the needs of the attacking troops, and to have engineer support available for meeting those needs promptly. The division engineer recommends the disposition of engineer troops and equipment for all phases of the offensive operation and recommends appropriate changes in disposition as needed. Liaison between supporting and supported units and between adjacent units during the attack assures cooperation and coordination among all units participating

in the operation. It is the responsibility of the supporting units to establish and maintain liaison with the supported organization. Liaison between adjacent units is established as directed by the senior commander—usually each unit is charged with maintaining liaison with the unit to the right. The assistant division engineer is the chief liaison agent between the engineer battalion and division headquarters. Liaison functions between the supporting combat engineer company and a brigade are performed by personnel designated by the company commander, usually the company executive officer. The liaison office is familiar with the capabilities and operations of both units and keeps himself informed on all plans and operations to give reliable and up-to-date information and advice to both commanders. If a further breakdown of engineer elements is necessary, liaison is established with their supported organizations.

Section II. MOVEMENT TO CONTACT AND ATTACK

6-3. Engineers in the Movement to Contact

a. General. A division moving to contact in an independent operation normally is organized into a covering force, an advance guard, a main body, and security forces. As a general rule, a division does not conduct offensive operations alone, but participates as a part of a larger force. In these cases, in a movement to contact, the larger force provides and controls the covering force.

- (1) The mission assigned the covering force is to develop the enemy situation and prevent unnecessary delay of the main body. It accomplishes its mission well forward of the main body.
- (2) The advance guard maintains contact between the main body and the covering force and expedites movements of the main body.
- (3) Units of the main body are organized for combat and positioned to permit maximum flexibility for employment during the advance and after contact

is established. Each column of the main body is responsible for its own security.

- (4) Flank and rear security forces protect the main body from ground observation and surprise attack.
- (5) The division engineer recommends disposition of available engineer troops and equipment (figs. 6-1 and 6-2) based on the scheme of maneuver announced by the division commander. He recommends appropriate changes in disposition as the need arises. Engineers may be used in the advance guard and in the flank and rear security forces as well as in the main body. If the engineer battalion is unable to perform all the engineer work required, the division commander may request reinforcements. In this case, additional engineer units are placed in support of the divisional engineer battalion by corps or army.

b. Specific Engineer Duties. During the movement to contact, speed is essential. Max-

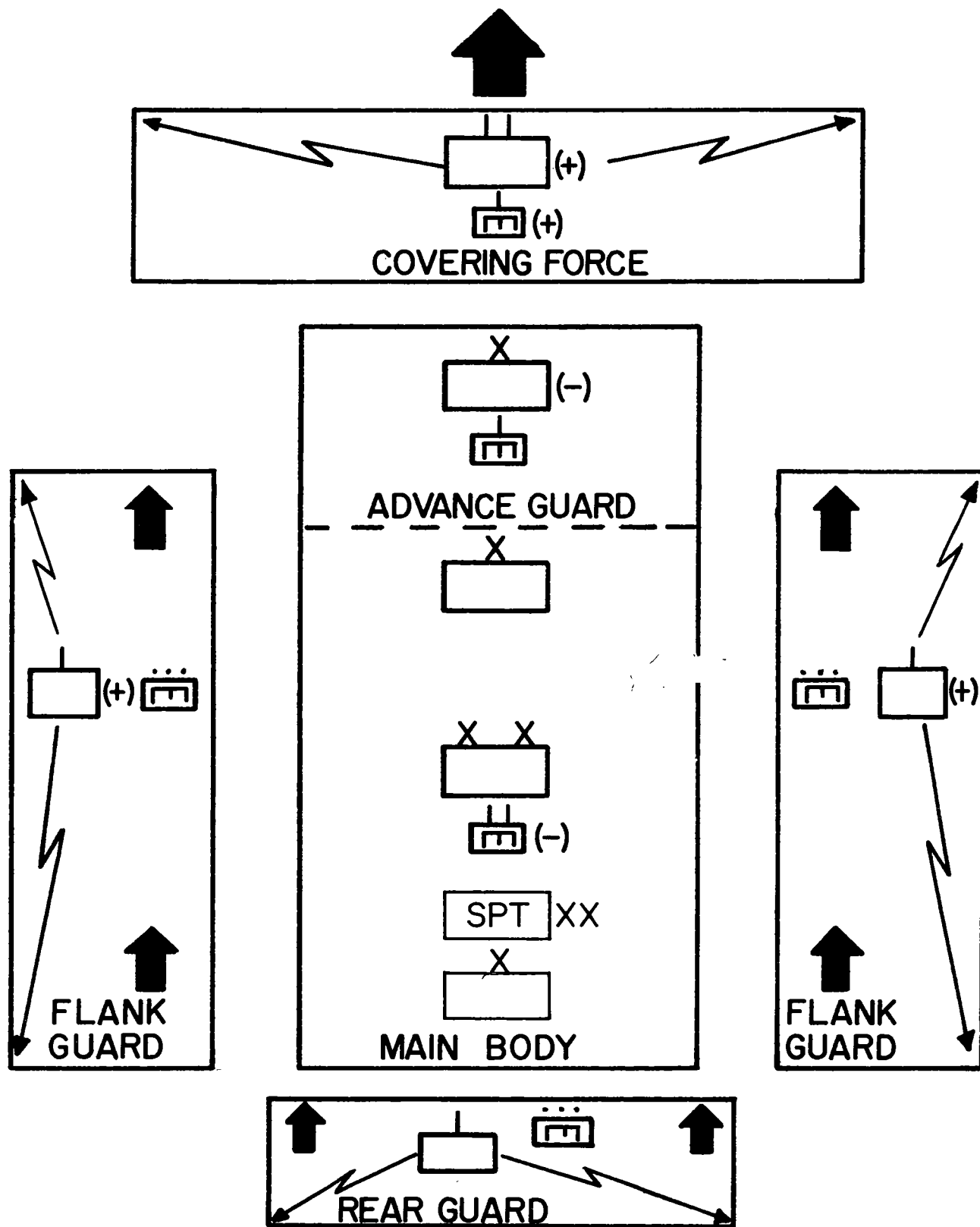


Figure 6-1. Engineer battalion disposition for the movement to contact of a division operating alone.

imum use of existing road nets and avenues of approach is emphasized. Early seizure of critical terrain is also important. Nuclear fires, including atomic demolition munitions (ADM), which is an engineer responsibility, may be used in conjunction with other nuclear fires to provide added security by blocking enemy avenues of approach. Other engineer duties in the advance include conducting reconnaissance; opening and improving roads, trails, and bridges for troop movement, supply and evacuation; reducing obstacles; assisting

in the passage of defiles; and constructing bypasses.

c. *Reconnaissance During the Movement to Contact.* Engineer reconnaissance during the movement to contact is performed initially by reconnaissance teams from battalion headquarters who often accompany armored cavalry security and reconnaissance units. These teams provide the division engineer with early, reliable engineer intelligence of the area over which the division is to advance. Routes of advance are thoroughly examined for serv-

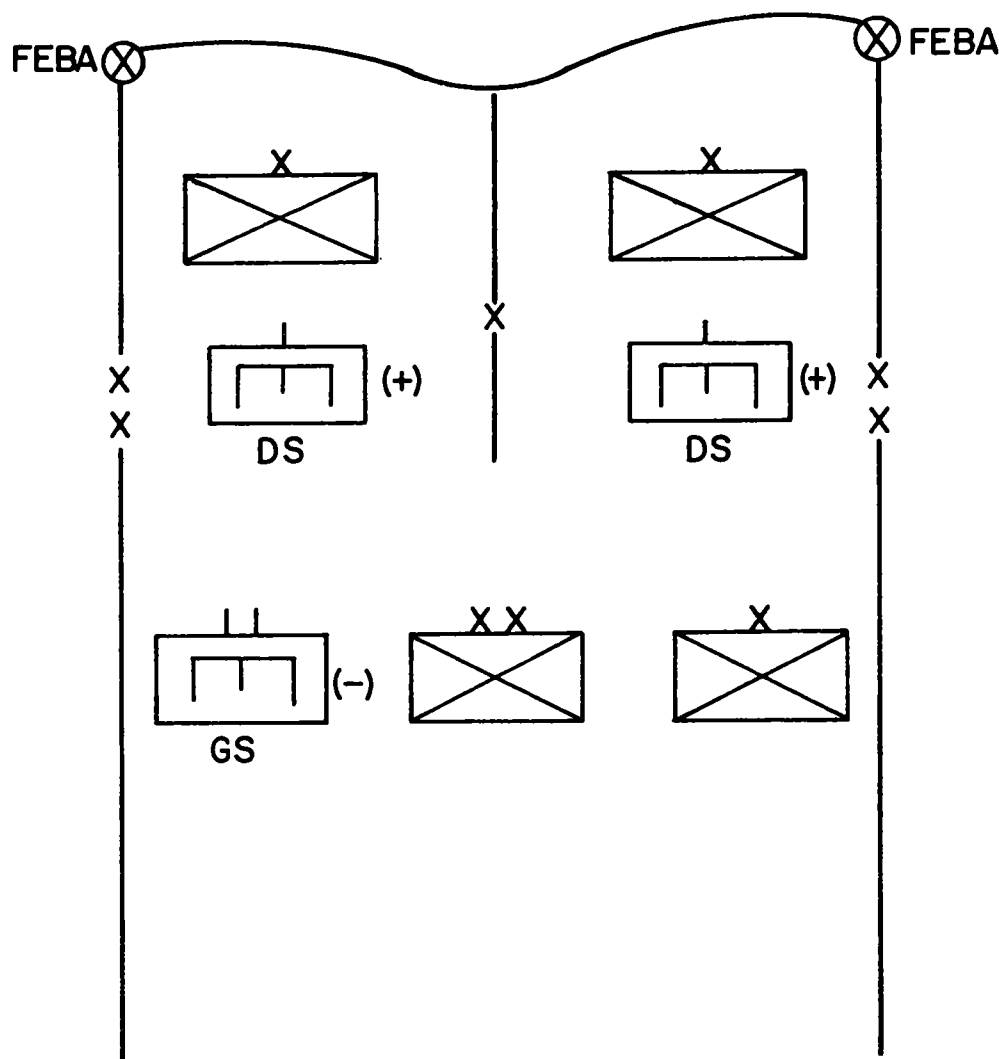


Figure 6-2. Engineer battalion disposition in the attack; infantry division.

iceability, type, condition, location of critical points, alternate routes, mines, and condition and types of bridges. Route information is forwarded to higher headquarters as it becomes available. The reconnaissance teams make an estimate of engineer work to be done and of engineer materials available. Estimates of work to be completed and time factors are continuously forwarded to highway traffic headquarters. The on-the-ground reconnaissance must be supplemented by air reconnaissance, map and aerial photograph studies, and study of reconnaissance from other elements of the command. It is essential that this reconnaissance is made prior to the movement, since the information gained provides a basis for the estimate of engineer troops, supplies, and equipment necessary to support the operation and for the selection of routes and the formation of traffic circulation and traffic control plans. Engineer reconnaissance elements from an engineer company may accompany the advance party of each leading brigade to provide the unit engineer with timely warning of engineer requirements to the front. Terrain which appears favorable to the advance is closely examined, especially for possible enemy use of mines, obstacles, and defending weapons.

d. Covering Forces. Missions assigned to a covering force are broad in nature and may include developing the enemy situation, attacking to destroy enemy resistance, seizing and holding critical terrain, or containing large enemy units. Engineer support in a covering force (to include engineer reconnaissance teams) should be located well forward to aid the movement of armor, artillery, and essential infantry support. When a brigade is operating as the division covering force, it usually has an engineer company and an assault bridge element attached. Obstacles which cannot be bypassed are breached or surmounted. The type of obstacle, the time, and the equipment available determine the method employed. Breaching usually involves removal or destruction by demolition. Surmounting an obstacle may require bridging or ramps. The width and number of passages through an

obstacle, whether it is a complex barrier or a minefield, are determined by the capability of the supporting engineer element. The location of the passage(s) is determined by the tactical plan, terrain, enemy position, and the extent of the obstacles. Road gaps which cannot be bypassed are hastily repaired or bridged. While conducting these tasks the engineers are armed with their individual and crew-served weapons to resist enemy interference. Operation of the passage is passed to military police as early as possible to relieve engineers for their primary mission.

e. Advance Guard. The main force advances behind the covering force. Each column is preceded by its own advance guard which furnishes protection from ground observation and surprise from the front, and provides the time and space necessary to enable the main body to deploy for combat. Each advance guard is supported by engineer troops and reconnaissance elements, whose commander is the unit engineer of the advance guard commander. During the advance of a brigade, elements or all of its supporting engineer company normally forms a part of the advance guard. When these engineers are on foot, they are supported by mounted engineer troops with tools and equipment, following by bounds, or they are equipped with standard mechanical clearing equipment compatible with the advance of foot troops. The point engineers normally have mine detectors and probes. They search for and mark or open a lane through an enemy minefield. (Complete clearing is undertaken after the combat units have moved through and there is less urgency.) Within their capabilities, the advance guard engineers remove all obstacles which have been left or only partially breached by the covering force. Removal or breaching of complex obstacles may require additional engineer troops and equipment which are moved forward from the element in support or reserve. The advance guard engineers maintain contact with the point. The remainder of the engineers with the advance guard, with tools, transportation, and equipment, move with the support or reserve, and leave work parties at vital points

where the need for engineer assistance exists or is anticipated. These parties rejoin their units on completing their tasks. The advance guard engineers may thus be depleted at the end of the march, and it may be necessary to renew their strength by substituting new units from the engineers with the main body. When the main force is not preceded by a covering force, the advance guard normally is stronger, with a corresponding increase in the strength of the engineer support.

f. Flank and Rear Security Forces. Flank and rear security forces protect the main body from ground observation and surprise attack. Engineers support the flank and rear security forces by being prepared to assist in the blocking of avenues of approach through the creation of obstacles such as craters, contaminated areas, minefields, demolished bridges, and floods.

g. Main Body. The main body contains the bulk of the advancing force's combat power. It is immediately available to attack the main enemy force and seize the objective. Supporting engineer troops are so positioned in the advancing columns of the main body as to permit maximum flexibility and communication with the security elements. They are available for employment during the advance to reinforce or replace the advance guard engineers or the flank and rear guard engineers.

6-4. Engineers in the Attack

a. Specific Engineer Duties. The duties of the engineers in the attack resemble those in the movement to contact (see para 6-3b). As the attack develops, however, new demands for engineer support arise. Reconnaissance is required both before and during the attack, especially of the main supply route and other

routes of advance, and of enemy obstacles and barriers. Specialized assistance from engineers may be needed to bypass, breach, or remove obstacles; assault fortified positions; establish flank protection; or organize captured ground against counterattacks. Upon gaining control of an area, the construction of advance landing facilities for the division's aircraft will be required. Site selection for these landing facilities is of vital importance to the engineer commander, as he must evaluate each potential site in the light of anticipated engineer effort, materials, and construction-time requirements. Water points may have to be established over a wide area because of the dispersion of the attacking units. These water points must be as mobile as the units they support, and, when possible, are located in the vicinity of the supported units' class I distribution point. Provision for security of water points must be made. Routes of advance for combat troops and essential supplies are established and maintained.

b. Reconnaissance in the Attack. During the attack, the reconnaissance teams from engineer battalion headquarters continue their general reconnaissance, closely following the forward engineer companies. They pay special attention to the routes of advance. When necessary, personal reconnaissance is made by the commander. Engineer companies attached to, or in support of, brigades make continuous reconnaissance of routes of advance, particularly the main supply route, obstacles, mines, potential water points, and sources of engineer materials in their assigned area. Special reconnaissance missions are assigned by the battalion S2. On the basis of this reconnaissance information, engineer operational plans are made and means are provided to assist in maintaining the momentum of the attack.

Section III. RIVER CROSSINGS

6-5. Basic Considerations

a. Purpose. The purpose of a river-crossing operation is to move the attacking force across the river obstacle as rapidly and as efficiently as possible so that it may either continue its

attack to destroy the enemy or to seize assigned objectives which will protect the crossing of the remainder of the force. In its broad aspects, a river-crossing operation includes—

- (1) Advance to the river.

- (2) Final preparation for crossing.
- (3) The assault.
- (4) Advance on the far side of the river.
- (5) Establishment of the bridgehead.
- (6) Protection of the bridgehead against counterattack.

b. Responsibilities. A river crossing is the tactical commander's responsibility, but the division engineers plan continuously for the support of division river crossings in the offensive. For major crossings, the division must be supported by corps and army troops, and the division engineer makes his requirements for support known as early as possible to the corps engineer. In establishing those requirements, the division engineer maintains close liaison with G3 on plans, exploits all sources of intelligence to determine what may be needed, and performs constant reconnaissance to specifically determine the requirements. Engineer tasks in the crossing include guiding the assault echelon from the assembly area (attack positions) to the crossing site, operating assault boats, assembling and operating rafts, assembling and maintaining footbridges and heavy vehicular bridges, removing mines, constructing approach roads, and exits. Plans for crossing a stream over which the enemy has destroyed all bridges must consider the strength with which the enemy holds the opposite bank and the characteristics of the river. If airdropped or airlanded forces are included in a river-crossing operation, timing of their portion of the operation must be coordinated with timing of the assault forces crossing the river.

c. Methods of Crossing. When the area through which the division will attack contains an unfordable river, plans must include provisions to cross without loss of momentum or significant concentration on either bank. The river is approached at maximum speed on a broad front. All existing bridges in the zone of advance are objectives and every attempt should be made to seize these intact. However, success of the division plan for crossing the river is not predicated on the seizure of bridges intact. If bridges cannot be seized in-

tact, a hasty crossing is made on a wide front capitalizing on organic assault bridging, amphibian characteristics of armored carriers, organic airlift capability, nuclear fires, chemical munitions, and improvised means. Particularly under nuclear conditions, the hasty crossing offers the greatest advantages and should be sought whenever possible. The deliberate crossing is conducted only when a hasty crossing has failed, when a hasty crossing is infeasible because of the difficulty of the obstacle or the strength of enemy defenses, or when an offensive is resumed at a river line. The success of either type crossing will depend on the thoroughness of prior planning and the commander's application of sound tactical principles.

6-6. Hasty River Crossings

A hasty river crossing must be boldly executed to gain surprise, to prevent the organization or strengthening of defenses, and if possible to seize an existing bridge or other crossing means. Advance elements are crossed by any means available. The one overriding consideration is that the momentum of the advance of the division must be maintained. Aggressive action sometimes results in the capture of a bridge before the enemy has destroyed it. At other times, a damaged bridge can be repaired, but in most cases military bridging or rafts will be necessary to cross tanks, artillery, other equipment, and supplies. Amphibious vehicles may be used to carry personnel and supplies where there are no bridges, or to supplement the carrying capacity of the available rafts and bridges. Hasty crossings must be anticipated, and all available river crossing equipment must be well forward and used promptly. Speed, surprise, and decentralization of control of specific crossing times of subordinate assault forces characterize the hasty crossing. However, traffic control is essential to insure maximum use of crossing means.

6-7. Deliberate River Crossings

A deliberate river crossing is a planned river-crossing operation which requires a

buildup of the required force and crossing means to overcome the barrier and enemy defense of the far shore. Detailed planning, extensive logistical preparation, and air and ground superiority are required. Overall planning and coordination are performed by corps or higher commands. The division normally conducts a deliberate river crossing utilizing its engineers in the assault phase. The divisional engineers have the primary mission of supporting the assault units during the assault phase by breaching obstacles, operating boats, preparing entrances and exits for vehicles, and aiding fording and swimming vehicles. The engineer battalions of the divisions not committed in a deliberate crossing are normally held out to provide engineer support when the divisions are committed on the far shore. Attached or supporting corps and army engineers usually are responsible for constructing rafts and bridges. Engineer amphibious forces, if available, provide amphibious assault landing vehicles and increase the combat support capabilities on the far shore. Normally, before the assault, attached or supporting engineers are assisted by elements of the committed division's engineers in such tasks as performing preliminary work on bridge approaches or access roads, and breaching obstacles. Elements of equipment and bridge units usually are attached to the engineer companies supporting the assaulting forces for use in establishing the bridgehead and for use in support operations on and beyond the far shore. Extensive operations require backup support from corps or army in the form of additional engineer units with fixed, floating, and assault bridging equipment. FM 31-60 discusses in greater detail the employment and duties of the engineers in river-crossing operations.

6-8. Crossing Means

Every available crossing means is used to cross the maximum number of troops and equipment in the shortest time. The amphibious landing vehicle such as the landing vehicle, tracked, personnel (LVTP), the armored personnel carrier, and the helicopter are three important means of getting personnel and sup-

plies across the river. When necessary, the divisional engineer battalion constructs rafts, mobile assault or float bridges, and expedient bridges. These are used to cross tanks (where fording is impractical), additional personnel, ammunition, heavy weapons, equipment, and necessary vehicles to support the bridgehead. Mobile assault ferries and bridging will be replaced by floating or fixed bridging as soon as possible to permit the divisional bridge company to retrieve the MAB and continue to support the division. If the bridge company is equipped with the M4T6 or class 60 floating bridge, the bridging normally is left in place, and the divisional bridge company immediately obtains replacement bridging from the nearest supply source. Although done infrequently, the floating bridging may be disassembled by one of the engineer companies or the bridge company and reloaded on the bridge trucks, which return to the supported organization for the next bridging operation. For a detailed discussion of river-crossing equipment, see TM 5-210 and FM 31-60.

6-9. Desirable Site Features

In the selection of crossing sites, both tactical and technical requirements are considered and evaluated. Conflicts between the two types of requirements are normal. The tactical commander weighs all the factors involved and arrives at the best overall solution. The following desirable technical characteristics are sought in crossing sites.

a. Raft Sites. Raft sites normally are located downstream from bridge sites. Desirable features include—

- (1) Short, easily constructed approach roads to existing road nets on both sides.
- (2) A gentle current near each bank at a straight reach of river.
- (3) Stream free from snags, rocks, shoals, islands, bars, and other obstructions which hinder crossings.
- (4) Cover and concealment on both shores for vehicles or personnel waiting to be loaded or unloaded.
- (5) Banks requiring minimum grading

for approaches. Water close to the bank should be deep enough to float a loaded raft without grounding.

b. Floating-Bridge Sites. Floating-bridge sites should have the following characteristics:

- (1) Short, easily constructed approach roads to existing road nets on both sides.
- (2) Moderate current.
- (3) Firm stream banks that can support abutments.
- (4) For M4T6 or class 60 floating bridges, assembly areas where pontoons may be inflated and sections of bridge assembled and launched. Pontoons usually are launched downstream from the bridge site. When tributary streams exist, it may be desirable to float sections to the bridge from launching sites on the tributary.
- (5) For the MAB, suitable entrances into the river.
- (6) Turnarounds for vehicles at unloading points.
- (7) Small variations in water level. Allowances must be made for changes in water level and velocity of current caused by floods and tides, particularly for their effect on the required anchorage.
- (8) Stream bottom in which anchors hold but do not foul.

c. Amphibious Vehicle Sites. The use of amphibian vehicles depends on the availability of suitable entrances and exits to and from the river and stream current within the capabilities of the vehicles to be used. Amphibious vehicles require banks with a gentle gradient and with a firm bottom for entering or leaving the water. Site requirements for special amphibious tracked landing vehicles, such as the LVTP, are less stringent than for others. The LVTP may be used in currents up to 11 kilometers per hour (3 meters per second) and on slopes up to 70 percent. The landing places must be wide enough to allow amphibious vehicles to land even though subjected to the lateral force of the stream current.

6-10. Traffic Control

a. Traffic regulation and control plans govern the ground and water movement of troops, equipment, and supplies throughout the river-crossing operation. Their purpose is to expedite the crossing of vehicles and minimize congestion to reduce vulnerability to enemy fires.

b. The G3 has general staff responsibility for insuring that the tactical forces move across the river obstacle at the designated crossing site and at the required time. The primary means of controlling the movement of forces, except the assault elements, is the traffic circulation and control plan. Although this plan concerns the movement of all vehicles, it primarily provides for the expeditious routing of combat support and combat service support traffic.

c. Traffic control planning is a general staff responsibility of the G4 and is closely coordinated with the G3 whose tactical requirements have priority. Traffic control planning is also closely coordinated with the provost marshal, the signal officer, the transportation officer, the division engineer, and corps engineer liaison personnel.

d. An engineer element exerts technical control at an engineer regulating point to insure proper use of the river-crossing means, to include—

- (1) Examination of vehicles to detect improper loading with respect to technique, weight, or dimensions.
- (2) Recommendation for rerouting or halting of certain traffic when technical difficulties make one or more of the crossing means inoperable, or curtail its carrying capacity.
- (3) Assistance to the division traffic headquarters in maintaining maximum safe traffic density.
- (4) Provision of the correct classification of each crossing means to the division traffic headquarters.
- (5) Prevention of congestion at the crossing sites.

e. For details see FM 31-60.

Section IV. GAPS AND DEFILES

6-11. Gap Crossing

a. Types of Gaps. Gaps found in the combat zone include antitank ditches, road craters, narrow streams, canals, washouts, ravines, railroad cuts, and other similar obstacles.

b. Gap Crossing Equipment. The armored vehicle launched bridges are used to cross short gaps in a minimum of time and with minimum exposure of bridging personnel to enemy fire. They are highly mobile and capable of quick erection so that the crossing of forward combat elements may be made rapidly. Components of the light tactical raft set, the M4T6 bridge, or the class 60 bridge may be used to construct fixed bridging to cross gaps of various widths. See TM 5-210 for types and classes.

c. Gaps may often be spanned rapidly and economically with expedient methods employing, demolitions, nonstandard bridging materials, or earth-fills emplaced by dozers or CEVs.

6-12. Passage of Defiles

a. Identification of Defiles. A defile is any terrain feature, natural or artificial, which tends to constrict the passage of troops. A mountain pass, a gap through a minefield, or an area between two radioactive areas are examples of defiles. Major forces passing through a defile are particularly vulnerable to air and nuclear attack.

b. Terms. Terms used in operations at defiles are defined as follows:

- (1) A *target zone* is a generally circular area centered on and encompassing a defile within which personnel would become casualties and equipment would be destroyed or severely damaged by the effects of a selected enemy nuclear weapon.
- (2) A *defile target zone coordinator* is an individual designated by the commander to plan and regulate traffic flow through the defile target zone. This individual is normally an assist-

ant division commander, a brigade executive officer, or a similar individual. The S3(G3) and S4(G4) are intimately involved in the planning for the movement of traffic. The defile target zone coordinator exercises absolute control of traffic moving through the target zone.

- (3) *Holding areas* are waiting spaces for vehicles located on both the near and far side of the target zone. These areas are far enough from the defile to insure against loss of vehicles and personnel from blast and thermal effects of an expected enemy nuclear weapon directed at the defile site. The areas may be large enough to accommodate battalion-size units but are preferably company-size and should be occupied for a minimal time to avoid creating a lucrative target.
- (4) *Traffic control points* (TCP) are critical locations at which traffic is controlled, normally by military police. Military police patrols are the principal means of traffic control and are used to connect the TCP. TCP and patrols operate under direct control of the defile target zone coordinator.
- (5) *Equipment parks* are small, well-camouflaged areas located near the defile for the central assembly of vehicles, equipment, and materiel for engineers' use during the defile operation.

c. Control Measures. Control measures are planned in advance and employed to insure successful passage of a defile. The following control measures and techniques are essential:

- (1) Establish the limits of the target zone.
- (2) Designate defile target zone coordinator.
- (3) Coordinate with the division traffic headquarters to regulate traffic outside the area of responsibility of the target zone coordinator.

- (4) Designate routes, including alternate routes for movement.
- (5) Establish traffic control points and patrols.
- (6) Select and establish well dispersed holding areas.
- (7) Select and establish equipment parks.
- (8) Establish and maintain all feasible means of communication among the defile target zone coordinator, the traffic control points and patrols, stationed wreckers, and the engineers at the points of construction.
- (9) Provide the defile target zone coordinator with adequate traffic control personnel, communications equipment

and personnel, engineers and engineer equipment, wreckers, and security units.

- (10) Figure 6-3 illustrates the control measures listed in (1) through (9) above.

d. Passage Procedures.

- (1) Forces must move into, through, and disperse beyond the target zone with great speed. Responsibilities for traffic regulation and control must be defined clearly. Engineer support required to prepare the defile site for passage should be accomplished under conditions of reduced visibility or at night, when practicable. The defile target zone coordinator is completely

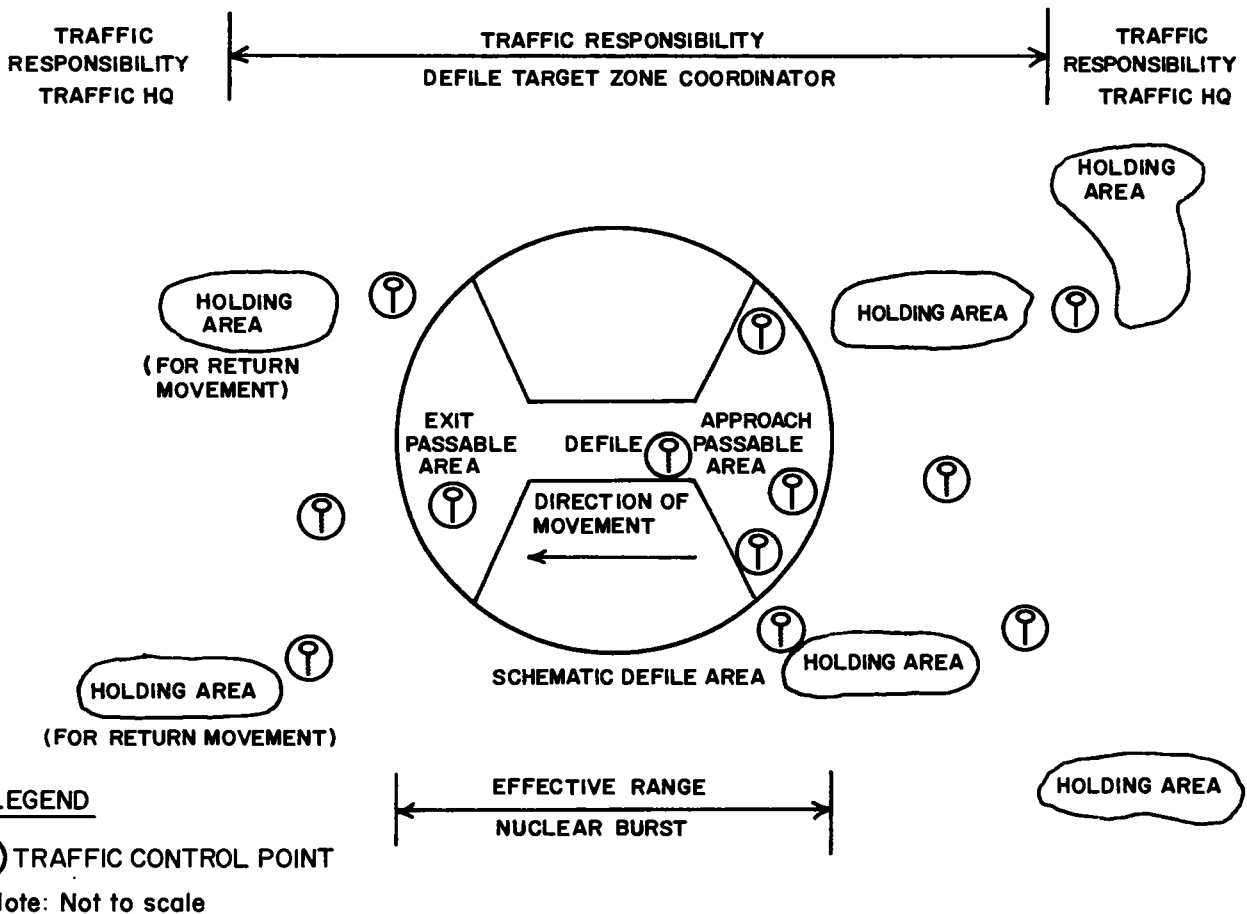


Figure 6-3. Control measures in passage of a defile.

responsible for planning, regulating, and controlling traffic into, through, and beyond the target zone. He establishes priorities for movement; schedule of movement; rates of march; size of march units; and input of traffic into the target zone. Traffic regulation must be enforced rigidly to insure smooth, constant flow and prevent disruption.

- (2) The division traffic headquarters controls—
 - (a) Movement of traffic into holding areas on the near side of the target zone.
 - (b) Movement from holding areas (if used) on the far side of the target zone.
 - (c) Normal movement beyond holding areas on the far side of the target zone.
- (3) To facilitate rapid movement of traffic through the target zone, the defile target zone coordinator establishes traffic control points and patrols between the holding areas and the perimeter of the target zone, within the target zone, and beyond the target zone up to holding areas on the far side. Wreckers should be stationed at critical points along all

routes, including alternate routes, and preferably near traffic control points, to be immediately available. The engineer must have at his immediate disposal equipment and materiel, located in equipment parks, necessary to reduce obstructions to free-moving traffic. Communications must be maintained among the defile target zone coordinator, wreckers, the traffic control points, the engineer at the defile site, the military police or other traffic control personnel, the traffic headquarters (at division level), and holding areas.

e. Alternate Routes. In the planning for a passage of a defile, alternate routes must be designated. Alternate routes should take advantage of concealed approaches to and through the target zone if possible. The negotiation of the defile by combat units should not be dependent exclusively on roads. All routes must be reconnoitered and made suitable for the anticipated volume of traffic.

f. Deception. Adequate deception measures must be planned to further the success of the main defile passage operation. Dummy equipment should be placed at additional selected defile sites to deceive the enemy and cause him to expend weapons on these sites.

Section V. FORTIFIED POSITIONS

6-13. Introduction

A fortified area is one containing numerous defensive works and localities, usually consisting of concrete, steel, or other permanent fortifications. The localities and works usually are disposed in great depth and width and in such a manner as to be mutually supporting. Contaminated areas may be used in conjunction with these defensive works. Such fortifications constitute one of the most formidable obstacles that advancing troops may encounter. A primary purpose of a fortified area is to cause the attacker to mass and present a profitable target. All commanders must recognize this danger. Whenever possible, fortified positions

are contained by minimum forces while the main force bypasses them and continues the advance to seize more distant and decisive objectives. If the fortified area is assaulted, reserves follow closely behind the assault echelon to exploit the penetration, maintain the continuity of the attack, or defend critical areas against counterattack. Reduction of a fortified area may include a siege or an attack from the rear. Airborne forces may be used in conjunction with other attacks of the fortified area principally to block the movement of large enemy reserve forces and to attack the fortifications from the rear. Unless required for use by the attacker, captured enemy armament and fortifications are moved or destroyed

to prevent their use if recaptured. Detailed characteristics of fortified areas and techniques of combat in them are contained in FM 31-50.

6-14. Engineer Support

Engineer support in an assault of a fortified position is fundamentally an application of the same techniques used for breaching any other obstacle of magnitude. In this instance, however, engineer units are used in conjunction with a reinforced infantry platoon as the basic assault unit. During the attack, the principal mission of the engineer is the breaching of the outer and larger obstacles which protect the main fortified position. Specially organized and equipped infantry squads are charged with the reduction of weapons emplacements, bunkers, and pillboxes, and the clearing of close-in and minor obstacles. Close coordination is essential between those engineers breaching the line of obstacles and those infantry squads reducing the fortifications. After the fortified line has been breached, the primary engineer task is the creation and maintenance of routes to and through the gaps, with a secondary mission of destroying, by demolition, the captured forts or pillboxes. As the assaulting troops break through or envelop the enemy position, engineers overcome the remaining enemy obstacles. Immediate exploitation of success is imperative. If the position is organized in depth, the attack or new attack, constituted by another combined arms team, must proceed to the second line of fortifications as soon as possible. The same techniques are used in reducing a second line as in the case of the first line. Assault units normally are organized into task groups for specific functions. Groups may be formed for the following tasks:

- a. Clearance of antipersonnel mines in advance of breaching personnel.
- b. Breaching or otherwise neutralizing an obstacle.
- c. Marking lanes and gaps after the breakthrough.
- d. Providing local security.

e. Laying smokescreens to conceal operations of the group.

f. Standing by as a contingent to replace or reinforce, as casualties are normally heavy in such operations.

6-15. Reconnaissance

Detailed intelligence is required upon which to base training, rehearsals, and plans. Before the attack begins, a preliminary engineer study is made of the terrain, bridges, routes of communication, and artificial obstacles such as minefields, tank traps, and emplacements. The techniques of attack and the requirements for engineer breaching personnel, supplies, and subsequent reconstruction are based on this study. Information for the study may come from various sources, of which ground reconnaissance is the most satisfactory. For areas beyond the reach of ground reconnaissance parties, information must come from aerial photographs and other sources. Ground reconnaissance before the attack should, if possible, cover obstacles in front of and on the flanks of the enemy position. Minefields are reconnoitered to determine their boundaries, types of mines; the presence of gaps in the field and whether and how they are marked; possible detours and approaches; and the location of defending weapons and chemical and radiological contaminated areas. The reconnaissance parties seek to determine the positions of the obstacles which are best adapted for clearing operations, either because of their weakness or because they are not well covered by fire. Normally, reconnaissance is done by the troops who are to breach the obstacles. Parties are given definite routes and areas; carefully instructed in their duties; and, when possible, rehearsed. Personnel are briefed on all available information.

6-16. Assault Methods

The area selected for penetration must be isolated. Nuclear fires are particularly well suited to this task. Smoke isolates individual strongpoints from the observed fires of other fortification. Indirect fire weapons destroy camouflage, neutralize and destroy enemy field

fortifications and artillery, fire on enemy counterattacks, and screen the movement of assault troops. When reducing field fortifications by the use of explosives, the techniques employed are essentially the same as those employed in the reduction of concrete walls. Nuclear weapons facilitate the destruction and neutralization of fortified areas. Nuclear bursts can create gaps in the fortified area or isolate section of it. ADM may be used to reduce a fortification if its extent warrants it. The resulting radiological contamination, however, must be eliminated, or materially reduced, if friendly forces are to occupy or pass through the area. Toxic chemical agents or

flame may be employed to neutralize a fortified area or to isolate sections of it. Combat engineer vehicles and self-propelled flame throwers are used to great advantage against fortified positions. Bulldozers are effective in the surmounting or bridging of obstacles, and for constructing and maintaining routes into and through the gaps. Other engineer equipment can be used to clear rubble and debris resulting from the demolition of fortifications. If all captured fortifications must be made unusable, bulldozers can move earth into the entrances of the captured fortifications instead of demolishing them.

Section VI. INTELLIGENCE

6-17. Reconnaissance and Counterreconnaissance

a. Engineer Reconnaissance. The collection of engineer information is a requirement for all elements in an offensive operation. It is as continuous and detailed as conditions permit and is performed throughout the operation. Details on engineer reconnaissance in the movement to contact are contained in paragraph 6-3c; in the attack, in paragraph 6-4b.

b. Counterreconnaissance. Counterreconnaissance operations are measures taken to prevent or reduce the effectiveness of hostile observation of a force, an area, or an installation, and are supplemented by counterintelligence measures. Engineers contribute to these operations by installing camouflage and deception items. Reconnaissance and counterreconnaissance cannot be completely separated. Each may provide information related to the other. Forces executing reconnaissance missions may be employed on counterreconnaissance at the same time. The order to the force must state which mission has priority. Counterreconnaissance becomes more difficult as dispersion of units increases.

6-18. Intelligence

Intelligence, mapping, geodetic, and terrain data are particularly important during an of-

fensive operation, and result in an acceleration of associated intelligence and topographic activities. Often the advance will be into relatively unfamiliar territory, necessitating rapid updating of existing maps; utilization of captured enemy maps; substitution of up-to-date aerial photomaps until topographic maps are available; rapid establishment or reestablishment of survey ground control; and production of terrain and weather studies. In meeting these intelligence needs, the battalion commander provides intelligence and information to three users: division; corps engineer; and the battalion and its subordinate and supporting units. The battalion intelligence officer (S2) assists the commander in these responsibilities.

a. Responsibility to Division. The division engineer furnishes timely information to the division commander and his staff on terrain; minefields and obstacles; effects of weather; effects of nuclear detonation on the terrain; enemy fortifications; enemy engineer troops, their capabilities, equipment, materiel, and techniques; routes of communication, and sources of usable engineer supplies and equipment. He works closely with the G2 in the preparation of the intelligence estimates and the intelligence annexes (FM 30-5). Spot reports on enemy engineer materiel should be disseminated through the G2 to the units of the

division as quickly as possible. The division engineer assists the G3 in the preparation of the operation orders on matters pertaining to engineer intelligence, such as in the engineer and barrier annexes.

b. Responsibility to Corps Engineer. The division engineer's principal responsibility is to furnish information on technical intelligence items. Technical intelligence involves the principles of design and operation, nomenclature, physical characteristics, performance, operational capabilities, and limitations of foreign material and facilities used by or for the support of military forces. For further information, see FM 30-16. The duties of the division engineer are to—

- (1) Plan for and supervise the engineer technical intelligence effort within the division.
- (2) Organize and direct the system of acquisition of captured engineer material and its evacuation to higher echelon engineers.
- (3) Forward to the corps engineer data developed for the division (*a* above).
- (4) Provide, within the engineer field of interest, information for the instruction of troops on foreign materiel to include recognition, characteristics, use, and interchangeability with United States or allied equipment.

c. Responsibility to the Battalion. The division engineer as the battalion commander, assisted by the battalion S2, directs the intelligence activities of the battalion (FM 5-30). These activities are—receiving, evaluating, analyzing, and interpreting reconnaissance data into engineer intelligence; disseminating all intelligence information to subordinate and supporting units: preparing terrain analyses and studies for use of the battalion; and supervising intelligence training.

6-19. Timing

Engineer intelligence must be placed in the hands of those agencies (troops commanders or staff sections) which need it, in time to permit them to make practical use of it in their planning and operations. Disseminating

agencies must allow for both time of physical transmission and time to clear intermediate headquarters before the item of intelligence reaches the ultimate user. This is especially important in the case of dissemination downward; it is also important, in a fast-moving situation, with respect to dissemination in any direction. In urgent cases, partial or fragmentary reports may be sent; summaries may be sent by wire or radio, in advance of a complete report; or incompletely processed information may be disseminated, with a precautionary note incorporated into the text of the report.

6-20. Sources of Engineer Information

a. The division engineer obtains engineer information in three ways—by the study of documents, to include the interpretation of photographs; from reconnaissance agencies; and by interrogation of individuals. More specifically, the sources are as listed below.

- (1) Aerial and ground reconnaissance.
- (2) Aerial and ground photographs.
- (3) Maps.
- (4) Prisoners of war.
- (5) Refugees.
- (6) Local civilians.
- (7) Captured enemy materiel.
- (8) Captured enemy installations.
- (9) Captured enemy documents.
- (10) Other documents, including texts, periodicals, and technical papers.
- (11) Intelligence publications (including terrain and weather studies).
- (12) Allied forces.
- (13) Units in contact.
- (14) Higher headquarters.

b. These sources are available to, and used by, the engineers of commands at all levels, but in varying proportions. At divisional level, ground and short-range aerial reconnaissance and reports from other frontline troops are of vital importance. Such sources, supplemented by data from local intelligence sources such as prisoner-of-war statements, bring up-to-date the available intelligence on terrain and enemy installations. In a fast-moving situation, these may be the only sources of such intelligence.

6-21. Terrain and Weather Studies

a. The most effective employment of military forces requires consideration of weather and terrain from the start of a plan through its final execution. Accurate interpretation of the effects of weather and terrain not only increases the probability of success in operations, but also helps determine probable enemy courses of action. The study of the area of operations aims to determine the effect of the terrain and weather upon the mission and upon the capabilities of the enemy. This determination is based on the key terrain features within the area and the best avenues of approach to them. The study frequently assists in eliminating those enemy capabilities not favored by the conditions of terrain and weather. For detailed information on terrain intelligence, see FM 30-10.

b. A terrain analysis is an evaluation of a piece of terrain in the light of the following five military aspects:

- (1) Key terrain features.
- (2) Observation and field of fire.
- (3) Cover and concealment.
- (4) Obstacles.
- (5) Avenues of approach.

c. The engineer, under the staff supervision of G2, is responsible for the production and maintenance of terrain studies based on technical analysis. These studies are either basic or interpretive. Basic studies emphasize the natural factors such as relief and drainage, vegetation, and soils. Analysis of these result in interpretative studies which indicate the terrain's suitability for military operations, such as its trafficability. Engineer terrain studies generally take the form of overprinted maps or overlays on which the various terrain characteristics are emphasized. This graphic description of terrain may, however, be supplemented by verbal summary. Typical studies include—relief (plastic relief and layer tinting); cross-country movement; vegetation; routes of communication; drainage; surface materials; cover and fields of fire; and concealment and observation.

d. Weather forecasts originate in the USAF and are disseminated through intelligence channels. Weather forecasts covering periods ranging from less than 12 hours to more than 3 days can be obtained. In some instances, studies of the climate may be of use.

Section VII. SECURITY

6-22. Basic Considerations

The divisional engineer battalion commander is responsible for the security of his battalion and all its units. However, in determining the security measures for the battalion, the commander takes into consideration the security measures of the division.

a. Definition. Security embraces all measures taken by a command to protect itself from espionage, observation, sabotage, annoyance, or surprise. It may be active or passive. Active security involves firepower and the use of troops. Passive security includes observation, cover, dispersion, camouflage, and the use of obstacles. The divisional engineer battalion commander employs a combination of the two.

b. Provision. Security detachments are required in all situations. Their mission is to

protect the main force against surprise attack and observation by enemy ground and air forces and to maintain freedom of action for the commander by gaining the time required to make proper disposition of personnel and equipment. Since security forces lessen the strength of the companies, they are kept to the minimum strength necessary to accomplish their missions. They should be mobile; and they should have an efficient warning system, including observers and means of communication, to give prompt notice of any enemy threat from the ground or the air.

6-23. Security During Movement

a. General.

- (1) Security must be provided for the movement of all engineer elements in the combat zone. The security tech-

niques which the engineer commander employs during movement of his unit depend on the unit mission, security provided by others, terrain, visibility, and expected enemy actions. Tactical rather than administrative considerations govern the conduct of the march.

- (2) An engineer unit moving on an independent mission provides its own security. It requires security for the front (advance guards), for the rear (rear guards), for the flanks (flank patrols), during halts (march outposts), and against attacks from the air. The security detachments should be more mobile than the main body of the unit.
- (3) When there is a probability of contact with the enemy, as in a fluid situation or when guerrillas are operating in the region, the commander provides for all-around security and develops plans to meet the attack. Individual weapons and ammunition are kept in the hands of troops. Machine-guns are manned and rocket launchers are dispersed throughout the column.
- (4) The engineer battalion must be well trained in passive defense against air attack. Distance between vehicles is greater than in rear areas. Panel sets are kept in readiness for use to avoid attack by friendly aircraft.
- (5) The importance of route reconnaissance and road guides and markers increases during a night march.

b. Frontal Security.

- (1) Security in front is provided by an advance guard. For the battalion, its strength usually does not exceed a company; for a company, a platoon; and for a platoon, a motor patrol of one or two vehicles.
- (2) The mission of the advance guard is to prevent unnecessary delay of the main body, to protect it from sur-

prise, and to limit enemy observation from the front. An advance guard accomplishes its mission by searching the terrain to the front and on each side of the line of march and by overcoming hostile resistance that is contacted. When contact with the enemy is made, the advance guard will attack aggressively to overcome resistance within its capabilities. If the enemy force is too large for the advance guard to attack, the advance guard will cover the deployment of the main body by maintaining pressure against the enemy.

- (3) A company acting as the advance guard for the battalion sends forward a squad as a point. The remainder of the company constitutes the advance guard minus.
- (4) In smaller units, such as the company and platoon, the advance guard usually consists of a point and an advance party.
 - (a) The point is the leading element in the movement. It protects the column from enemy surprise. When the point encounters the enemy, it employs rapid fire and maneuver against the enemy force. It maintains contact with the enemy until the advance party has time to deploy.
 - (b) The advance party provides support for the point in the event that the point fails to eliminate the enemy. The advance party takes aggressive action against the enemy and tries to overcome the force so that movement of the main body is not delayed or halted. If the advance party fails to eliminate the enemy force, it maintains contact with it until the advance guard minus can be committed.
 - (c) The advance guard minus maintains contact with the advance party and should always be prepared to assist the advance party in moving against the enemy force.

If the advance guard minus is unable to reduce enemy resistance, it immobilizes the enemy by fire and maneuver until the arrival of the main body.

- (5) Distances between the point and the advance party, between the advance party and advance guard minus and between the advance guard minus and the main body vary according to the speed of movement, terrain, visibility and enemy situation. Distances usually are decreased when enemy contact is imminent and during periods of reduced visibility. These distances are great enough to allow each succeeding element to deploy without serious interference from the enemy when contact is made. However, these distances are not so great as to prevent each element from rapidly assisting the element in front of it. At high speed, distances are increased; at low speed, they are decreased. Vehicles are spaced at distances of from 50 to 200 meters in order to provide protection against air attack and to maintain uniform speed.

c. Rear Security.

- (1) Rear guards are used to protect the rear of a column advancing toward the enemy if an attack or harassing action from the rear is deemed within the enemy capabilities, or to protect the rear of a column marching away from the enemy.
- (2) A company should adopt a formation similar to that of the advance guard in the reverse order of march. The distances between elements of the rear guard vary with the situation, the terrain, and the visibility. They correspond generally to the distance between elements of the advance guard. When the column halts, the rear guard dismounts and forms a march outpost.
- (3) When an enemy pursuit is close, elements of the rear guard delay the

enemy to permit the next preceding unit to make suitable dispositions. Fire is opened at long range. Usually, elements do not move toward the enemy to reinforce a lower element. The larger element occupies a delaying position to cover the withdrawal of the smaller element. The element in contact with the enemy then withdraws under the protective fires of the element occupying the delaying position. The rate of movement is coordinated with the main body.

- (4) The rear point stops to fire only when enemy action threatens to interfere with the march. The rear point is not reinforced by other troops. When the rear point withdraws, it uses a route that does not mask the fire of the rear party.

d. Flank Security. In open terrain, flank security may be sufficiently assured by speed of movement and constant observation to the flanks. This usually will not suffice, however, in heavily wooded, rolling, or mountainous terrain, or where the menace of guerrilla operations exists. Continuous flank patrolling is possible only where a parallel route exists (a condition not usually enjoyed by units of company size), but effective employment can be made of small flank patrols sent out to side roads, commanding ground, and points of observation. Flank security detachments usually are not strong enough to effectively delay the enemy. Their mission is to give early warning of enemy activity; hence, they must be equipped with adequate communication facilities.

e. Motorized Security Patrols. The motorized security patrol is used for reconnaissance and all types of security operations and particularly as the point of an advance or rear guard. Motorized patrols are limited in effectiveness by the fact that they are roadbound and easily ambushed and captured or destroyed. Therefore, at least two vehicles plus any other vehicles required for messengers are required. An engineer company moving alone has enough vehicles, weapons, and men to use

more than one vehicle in either its advance or rear security patrol.

6-24. Security at Halt and in Assembly Area

Whenever an engineer unit is at a temporary halt during a march, or is in the assembly area, it provides its own security. It does this by establishing an outpost system to secure the main body against close observation and surprise by the enemy. The outpost system is so organized and disposed that it can deal with a minor enemy threat without disturbing the main body or forcing it to take action, and in case of a major threat, it can at least hold off the enemy until the main body can make preparation for action. The composition of the outpost varies for each situation. The outpost system consists of outposts, sentinels, and visiting patrols. Outposts should be positioned so they can achieve overlapping sectors of observation and mutual fire support. Sentinels may be required at night or during other periods of poor visibility to prevent surprise and for complete coverage of the area. Sentinels should be positioned forward of and between outposts within rifle-support distance of the outposts. When observation is limited or when outposts are widely separated, visiting patrols may be used to operate between outposts and sentinels. Communication is established between all elements of the outpost system and the main body. If the enemy penetrates any portion of the outpost system, the main body takes measures to protect itself. The measures provide for personnel who form a support or reserve force which counters the enemy penetration. All other personnel take action to secure the unit's immediate area. Interior guards, designated from elements of the main body, continue to carry out their duties within their assigned area. The engineer unit commander, if possible, halts in an area where there are few or no civilians. If this is impossible, all personnel are warned to keep civilians, including children, away from the area or not to allow them to enter until they are screened.

6-25. Convoy Security Detachments

Lone vehicles and convoys not capable of

providing their own security are grouped and escorted through danger areas by armed security detachments. These detachments are specially organized and trained to protect convoys from hostile guerrilla actions and may contain elements of armor, infantry, and engineers. The size and composition of a detachment vary with the terrain, the capabilities of hostile guerrilla forces, and the size and composition of the convoy. Traffic through known danger areas normally is controlled by traffic control points and patrols. The engineer element is placed well forward in the column to perform such engineer tasks as minor bridge and road repair, obstacle removal, and detection and removal of mines.

6-26. Unescorted Convoy Operations

When the divisional engineer battalion is not escorted through a danger area by a convoy security detachment, it organizes its own convoy security. Part of the available troops are placed well forward in the convoy and a strong detachment is placed in vehicles that follow the main body. Radio contact is established between the two groups if possible. Speed is essential. Sharp curves, steep grades, or other areas where low speed is necessary, must be reconnoitered by foot troops. At the first indication of ambush, while the convoy is in motion, leading vehicles increase their speed if the road appears clear. In this effort to run through the ambush area, they go as fast as it is safe to drive. Drivers or assistant drivers of vehicles disabled by enemy fire or mines seek to direct their vehicles to the sides or off the roads so as not to block rear vehicles. Troops from vehicles stopped in the ambush dismount and return fire, using all weapons. Troops from vehicles breaking through the ambush dismount and attack back against a flank of the ambush position. The rear guard of the convoy, upon learning that the main body has been ambushed, dismounts and attacks forward against the other flank of the ambush position. If the enemy allows the main convoy to pass through and then ambushes the rear guard, troops from the main body return and relieve the rear guard by an attack against the flank of the ambush position.

6-27. Security at Worksites

a. The amount of security the engineer commander furnishes at the worksite depends on the engineer mission, guerrilla activity in the area, the terrain, and the nearness of the enemy. For larger tasks, such as the engineer battalion constructing a road, the division usually provides the security forces. For smaller tasks, such as a company or platoon constructing a bridge, when security forces are not provided by the supported unit, the individual in charge of the construction project provides security with personnel from his unit.

b. In forward areas of the combat zone, the principal types of enemy action against which the working parties take security measures are dismounted patrols, motor or mechanized raids, and air attacks. Near the rear of the zone, there is less danger of enemy ground action, except guerrilla attacks. Air, nuclear, biological, and chemical attacks may occur anywhere.

c. Enemy ground action usually can be guarded against by careful observation and by small security detachments covering probable avenues of approach. These may be supplemented by readily removable roadblocks, portable wire obstacles, and mines. The engineer in charge of the worksite withdraws as few men as possible from work to use for security. However, working parties are always prepared to defend against possible ground raids. They keep their weapons close at hand; and they are trained to assemble, with their weapons, when they receive the warning.

d. The engineer in charge of working parties prepares for security against air attack by training the parties in warning, concealment, dispersion, and fire. He trains the men to identify friendly and enemy aircraft. He posts guards at points of vantage; and he disperses and conceals equipment and vehicles which are not being used. He makes maximum use of the combat engineer vehicles and the personnel carriers, with their vehicular-mounted weapons. To provide security, when required, the individual in charge of the worksite has

machineguns emplaced so that they can be used against low-flying aircraft. For protection against air attack on a major rear-area project, the responsible engineer officer requests air defense artillery through channels.

e. For security of ADM operations see FM 5-26.

6-28. Security Against Guerrilla Forces

Guerrilla bands usually employ offensive tactics characterized by surprise, mobility, deception, and decentralized operations (FM 31-15). The divisional engineer battalion commander insures that all engineer units are briefed on the fighting techniques of guerrilla forces. The precautions and countermeasures which the engineer units use against guerrillas vary with the nature of the threat. At halts, and in assembly areas, guards are posted at all times including periods of rest and recreation. Groups of local inhabitants of any considerable size are not allowed near the assembly area. Local civilians are subjected to rigid security checks before they are allowed to work in engineer installation. Working parties observe security precautions while they are working, resting, and eating, and when they are going to and from the jobs. When a party leaves a task to return to camp, it takes with it all tools, transportation, and readily removable equipment. A party returning to an incomplete task is alert for ambushes and booby traps, and it gives special attention to the security of arms, ammunition, and other equipment of value to the guerrillas.

6-29. Security Against CBR and Nuclear Attacks

The engineer battalion commander is responsible for the security of the battalion and its components against chemical, biological, and radiological (CBR) and nuclear attacks. For information pertaining to unit protective and defense measures see FM 21-40, FM 3-12, and FM 101-31-1. For information pertaining to individual protection see FM 21-41. Individual and unit training procedures are contained in FM 21-48.

Section VIII. COUNTERINSURGENCY OPERATIONS

6-30. The Counterinsurgency Environment

In counterinsurgency operations many factors contribute to making the environment different from that of limited or general war. Among these factors are—

a. The terrain is generally ill-suited to conventional military operations.

b. Forces usually are dispersed over an extremely wide area.

c. The adversary generally is elusive, hard to identify, highly trained in the techniques of guerrilla warfare, and well motivated.

d. Winning the support of the people is a continuous requirement in counterinsurgency operations. In consideration of this, the application of direct and indirect fires must be highly selective and restrained when operating among a population whose material and physical well being must be protected so as not to alienate the people from the government.

6-31. Role of Engineers

Divisional engineer battalions or elements thereof will support counterinsurgency operations by supporting the division or divisional elements in counterinsurgency missions or through independent operations designed to support receiving state forces or U.S. forces already in country. Engineer combat elements when committed usually will maintain their organizational integrity, but may be organized provisionally into task forces, depending upon the particular engineering skills and equipment required. For a general discussion of engineer units in counterinsurgency operations, see FM 31-22.

6-32. Engineer Capabilities

Engineer combat elements in a counterinsurgency role may help a receiving state counter insurgency by—

a. Providing traditional engineer assistance to indigenous military forces or to U. S. forces committed to counterinsurgency operations.

b. Providing training assistance and advice to receiving state engineer forces.

c. Planning, organizing, and supervising construction projects to be carried out by indigenous personnel in accordance with U. S. or receiving state civilian or military programs.

d. Making engineer surveys to support future engineer projects and to provide a basis for increased engineer assistance should the insurgency escalate.

e. Providing assistance in military civic action projects (digging wells, building schools, water irrigation systems, etc.) designed to improve the well-being of the people and to encourage their support of the receiving state forces.

6-33. Special Considerations

When divisional engineer battalions are committed to counterinsurgency operations, various problems and considerations will arise not normally associated with conventional engineer operations. Among these are the following:

a. Since units are usually dispersed over extremely wide areas, command supervision, to include training, maintenance, and other unit activities will be much more difficult.

b. Because of the nature of the terrain, the critical need for numerous construction projects, and the nationwide lack of engineering skills, there will be an especially heavy demand for engineer unit skills and knowledge.

c. With all engineer activities and projects generally susceptible to insurgent attack at any time, engineer unit commanders must insure that—

- (1) Personnel are fully trained in the use of all unit weapons and are continually alert to possible surprise insurgent attack.
- (2) Defense measures are taken around all engineer unit projects and activities.

d. Small unit commanders will be required frequently to make decisions based upon their own judgments, considering the situation at hand, rather than upon specific guidance and directions received from higher headquarters. The imagination and initiative of individual engineer commanders will especially contribute to the effectiveness of the engineer effort in counterinsurgency operations.

6-34. Psychological Operations (PSYOP)

Considerations

Engineering units, with attached psychological operations elements, are capable of un-

dertaking many military civic action projects to improve the living conditions of the local populace. However, once a task is started it must be completed, since construction programs that are not completed furnish material for the insurgent propagandist. A carefully planned military civic action program, properly publicized, can create a favorable atmosphere and assist in developing a firm and stable government. A PSYOP campaign should be conducted before, during, and after the completion of an engineer project. Requests for PSYOP assistance should be forwarded to higher headquarters (see FM 33-1).



CHAPTER 7

DEFENSIVE OPERATIONS

Section I. INTRODUCTION

7-1. Purpose and Forms of Defense

a. Purpose. Defensive operations are actions to prevent, resist, repulse, or destroy an enemy attack. The defense is undertaken to develop more favorable conditions for subsequent offensive operations, economize forces in one area in order to apply decisive force elsewhere, destroy or trap a hostile force, deny an enemy entrance to an area, or reduce enemy capability with minimum losses to friendly forces. The fundamental forms of defense are the mobile defense and the area defense. Generally, neither type is used in its pure form when conducting defensive operations. More often the most suitable form of defense for a given situation will be some variation of either the mobile or area defense, incorporating elements of each. The defense established is that which best meets the requirements of the particular situation.

b. Mobile Defense. The mobile defense is that form of defense in which minimum forces are deployed forward and priority is given to use of mobile combat elements and fires concentrated in the reserve. Primary reliance is placed on the use of offensive action by the reserve to destroy enemy forces. In the mobile defense, the defender plans to accept decisive engagement and to accomplish his mission primarily by executing offensive action against the attacking enemy forces. Control of the forward defense area and the retention of terrain are not primary objectives of the counterattack. The fixing forces, those minimum necessary forces committed initially in the forward defense area, conduct defensive, delaying, screening, or limited offensive operations in any combination required in order to make the attacker vulnerable to the counter-

attack. Mobility equal or superior to that of the enemy is essential for all elements of the defensive force. Figure 7-1 depicts a typical disposition of a divisional engineer battalion in a mobile defense.

c. Area Defense. The area defense is that form of defense in which emphasis is placed on retention of or control over specific terrain. Reliance is placed on the ability of fires and forces deployed on position in the forward defense area to stop and repulse the attacker. The forward defense area has a higher priority for combat power than does the reserve. In the area defense, the defender plans to accept decisive engagement and to accomplish his mission primarily by engaging the attacker along the forward edge of the battle area with a large volume and variety of fires. Counterattacks are conducted primarily to eject or destroy enemy forces that penetrate the position and so to regain control of the forward defense area and terrain which the defense has been designed to retain. Figure 7-2 depicts a typical disposition of a divisional engineer battalion in an area defense.

7-2. Disposition of Engineer Support

Defensive areas include the security area, the forward defense area, and the reserve area.

a. Security Area. The division security area begins at the forward edge of the battle area (FEBA) and extends as far to the front and the flanks as security elements are employed. Forces in the security area furnish information on the enemy; delay, deceive, and disrupt him as much as possible; and provide a counterreconnaissance screen. They also may have

the mission of locating and developing nuclear targets. Forces operating in the security area may include elements from echelons higher than division, such as a corps covering force and units to provide aerial surveillance and flank security. Division forces in the security area will consist of the general outpost (GOP),

combat outposts, flank security forces, division aerial surveillance elements, and patrols. There is no prescribed organization for the general outpost or covering force. The GOP may be a brigade or elements thereof, the armored cavalry squadron, or a battalion task force as required. An engineer unit normally is at-

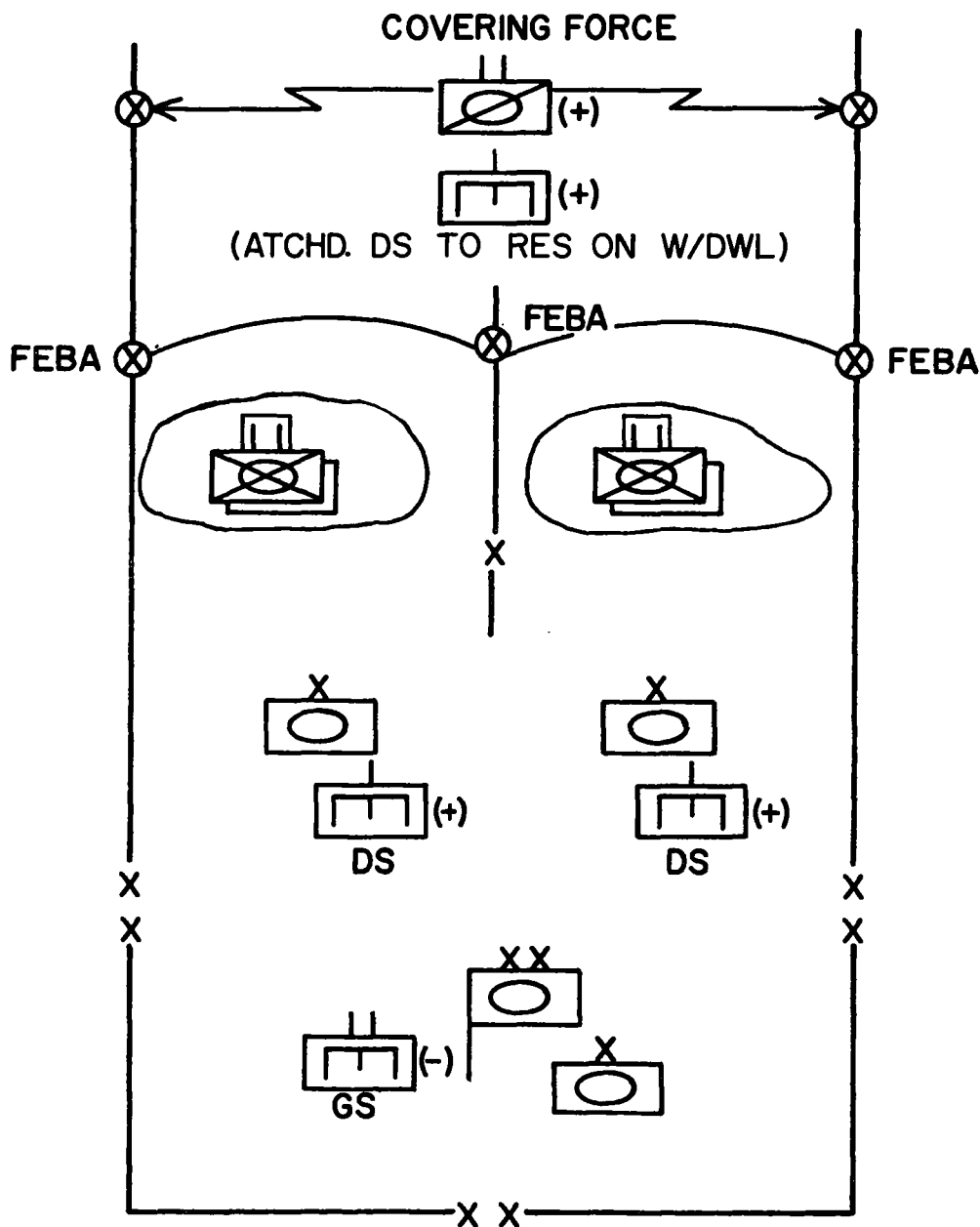


Figure 7-1. Typical disposition of a divisional engineer battalion in a mobile defense.

tached to the GOP force. The engineer unit commander advises the general outpost or covering force commander on engineer work and assigns missions and areas of responsibility to his subordinate units. Each unit with an area

assignment is responsible for keeping open the main withdrawal route within its area and preparing the obstacles along that route. Each unit is also responsible for preparation and execution of obstacles on the lateral roads

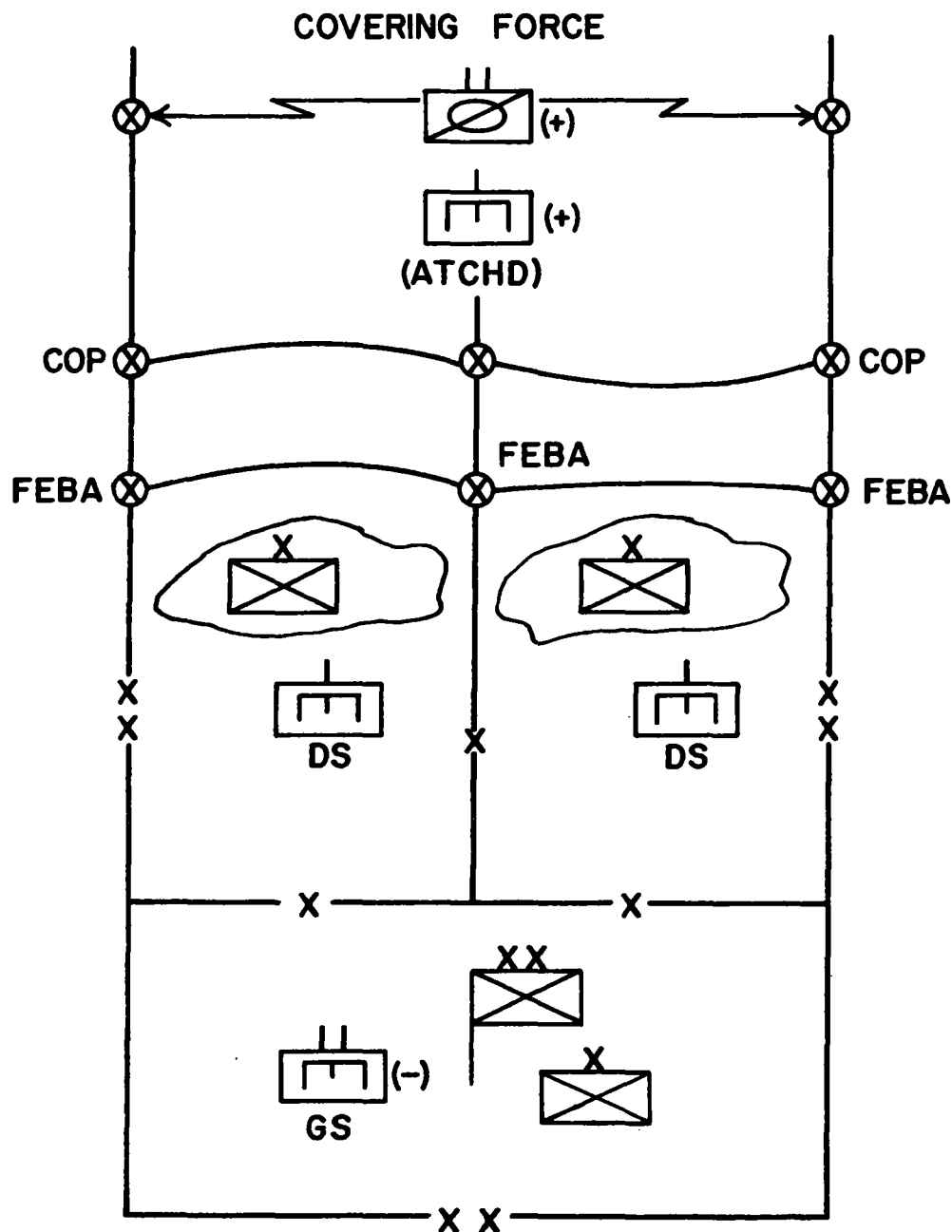


Figure 7-2. Typical disposition of a divisional engineer battalion in an area defense.

within its respective area. On the combat outpost (COP), engineers have generally the same mission as in the GOP, though on a smaller scale. Engineer tasks would generally include—preparation and execution of conventional demolitions and atomic demolition munitions; preparation of obstacles; and pioneer construction tasks.

b. Forward Defense Area. The forward defense area extends rearward from the FEBA to include that area organized by the forward committed units. The composition of forces in the forward area depends on the form of defense employed, but there is usually one engineer company in direct support of each committed brigade. The remaining engineer companies are in general support of the division and have a secondary mission of supporting other task forces on order. In the mobile defense, the fixing force commanders organize their areas by establishing defensive positions augmented by observation and listening posts and patrols. The positions are areas organized for all-round defense by elements varying in size from a company to a battalion task force. They are located to control terrain that dominates avenues of approach and to repel, delay, or canalize attacking forces. Alternate or successive positions are designated in depth. Because of the limited forces in the forward area, these positions cannot be initially occupied in depth. The forward defense force is allocated the minimum essential forces to carry out its mission. It normally is infantry heavy. In the area defense, the forward defense area is organized into defensive positions which provide good fields of fire, observation, and natural defensive strength. Positions are prepared to block avenues of approach at the FEBA and in depth to control the area. The natural defensive strength of the terrain is increased as time permits by the use of artificial obstacles, fortifications, and barriers.

c. Reserve Area. The reserve area extends rearward from the forward defense area to the division rear boundary. The reserve echelon mans the reserve area, consists of those uncommitted forces held under division control, and is the principal means by which the com-

mander influences the defensive battle and regains the initiative. The combat power of the reserve may consist of nuclear weapons, maneuver elements, or both. The reserve is organized to destroy or repulse the enemy by offensive action and must be prepared for timely commitment on division order. Should it be infeasible for the division to counterattack, the reserve may be employed in a blocking role to assist in containing the enemy penetration prior to the launching of the corps counterattack. One brigade headquarters normally is designated to control the reserve. However, in some situations, the reserve may be controlled by a provisional task force headquarters or placed under division control.

d. Primary Combat Support Missions in the Defense. Engineers may be attached to or placed in direct support of the brigades. Normal support is one engineer company for each brigade, although this is varied to meet specific requirements. Engineers with the security force normally are attached. The engineer battalion, less elements attached to major subordinate units, is kept under division control. The primary combat support missions of the division engineers in the defense are to increase the defensive capabilities of combat troops by assisting in the organization of the ground and in the preparation of defensive positions and to assist the movement of reserves in the counterattack. Engineers may prepare demolitions, lay minefields, and prepare and maintain routes. Obstacles are used extensively in the defense. Time permitting, the defensive capabilities of the ground are augmented by artificial obstacles and improvement of natural obstacles until a barrier system has been created through which the enemy cannot penetrate without a costly expenditure of men and materials. The installation of obstacles is the responsibility of the area or sector commander; however, the commander may call upon engineers to supervise the construction and, if necessary, to perform the construction. For prescribed types of fortifications, see FM 5-15. The division engineer assists in the formulation of the overall barrier plan and its implementation. When authorized, atomic demolition munitions may be used to deny spe-

cific areas and strengthen the position. The decision to employ an ADM rests with the commander to whom the weapon is allocated. The engineer is responsible for designating the emplacing and firing unit and for coordinating the supply and movement of equipment, materials, and personnel to support the mission. The G3 coordinates tactical security and troop safety for ADM missions. The engineer battalion commander is responsible for the physical security of the munition, including the time during which the ADM is en route from the special ammunition supply point (SASP). However, when the ADM team joins the tac-

tical unit to which it is attached, responsibility for physical security of the ADM passes to the tactical unit commander. Command of an ADM operation normally is exercised by the tactical commander in whose area the emplacement is located. He is responsible for general area security, liaison, communications, and gives the order to detonate the munition. The ADM team chief directs all technical operations at the emplacement site, detonates the ADM on order from the tactical commander, and conducts the necessary operations in the event of a change of the ADM mission.

Section II. ENGINEER RESPONSIBILITIES IN THE DEFENSE

7-3. Security

The security measures taken in a defensive operation are essentially the application of the basic principles of maintaining security under any conditions (para 6-19 and 6-20).

7-4. Reconnaissance

a. As in the offense, engineer reconnaissance in the defense is continuous and detailed. Emphasis is placed on the preparation of routes for counterattack forces, obstacles, and demolition sites.

b. In an area defense the engineer battalion reconnaissance teams search the area in detail and report all items of engineer interest. These become the basis for barrier and obstacle plans; routes of supply, evacuation, and withdrawal, and denial operations plans.

c. A divisional defensive location is often on familiar terrain, and information on the area is available in corps or army. The division engineer is responsible for the collection and utilization of such available information.

7-5. Barriers and Obstacles

a. Barrier and obstacle planning is developed concurrently with other plans, and can be planned and executed by all echelons of commands. Extensive strategic or major tactical barrier systems, however, are directed by

corps or higher. G3 has general staff responsibility for the tactical employment of barriers and obstacles, while the division engineer has the special staff responsibility for their planning. The division engineer prepares terrain and barrier studies for G2, and advises G3 as to ways of improving and extending natural obstacles. He plans and supervises the technical aspects of obstacle employment and prepares the barrier annex to the division operation plan or order, under the direction of G3. Division barrier and obstacle planning usually is supplemented by detailed planning of tactical obstacles at the brigade level.

b. The construction of obstacles for close defense is the responsibility of the unit commander involved, and may be integrated with a barrier plan of higher echelon. Normally, each combat unit is responsible for the construction of the obstacles or that part of a barrier system which lies within its area. These obstacles normally are defended by infantry or armored units.

c. Engineers furnish assistance to the combat units in the form of effort, advice, and technical supervision. They may be assigned the responsibility for the siting and construction of obstacles or blocking positions when one or more of the following conditions exists: special skills and equipment are required; flanks and rear are exposed; the command as a whole will benefit from the effort; the ob-

stacles must be prepared before the arrival of the troops who will occupy the position; or the construction is beyond the capability of a particular defending unit.

d. In the defense, detailed coordination is necessary to assure that installation of obstacles and barriers will not interfere with the freedom of maneuver of defensive forces. Time permitting, the natural defensive characteristics of the terrain are improved and augmented by artificial obstacles until a barrier zone has been developed which the enemy cannot penetrate without a costly loss. An effective method of erecting an obstacle in ordinary terrain is by demolition of bridges over unfordable streams. Bridges are prepared for demolition and destroyed, on order, to prevent them from falling into enemy hands. All "prepared" bridges must be adequately guarded to prevent enemy interference with the explosive. Craters or vertical obstacles on main road nets in locations difficult to bypass, such as heavy woods, steep sidehill slopes, or swamps, are also satisfactory obstacles.

e. In a mobile defense, obstacles and barriers are employed to delay or canalize the enemy. They must be carefully coordinated, however, because of the necessity for freedom of movement of the maneuvering forces in a counter-attack. Gaps and lanes must be available for friendly armor and infantry to move forward or backward or to adjacent areas to occupy battle positions.

f. Mines are used as an obstacle, or as a supporting obstacle in a barrier system. The integration of chemical mines in the system produces contamination which makes breaching operations more difficult and time consuming. Extensive use of mines, however, poses a logistical burden. Such use should be limited to relatively static or economy-of-force defensive situations.

7-6. Denial Operations

A denial operation is a defensive measure designed to deny the enemy the use of material objects, facilities, and geographical areas.

Denial operations involve the removal, damaging, or destruction of objects, or the denial of ground through the use of mines, flooding, or demolitions. Toxic chemical and radiological contamination may be used to restrict the use of an area through threat of casualties. A theater or theater army denial policy normally is the basis for detailed denial planning in the combat zone. It is a command responsibility, with authority usually delegated to subordinate commanders to effect denials as a normal activity within their areas, subject to the limitation and directive published by higher headquarters. The general and special staff responsibilities are the same for denial operations plans as for barrier plans. In the division, denial operations normally are incorporated in the barrier plans. The divisional engineer battalion is well suited and equipped to supervise and execute such denials. All troops, however, participate in certain aspects of denial operations, including the destruction of organic equipment and supplies, procedures for which normally are included in the unit's SOP.

a. *Items Denied the Enemy.* Military supplies and equipment are evacuated to the extent possible. According to the Rules of Land Warfare of the Geneva Convention, medical supplies will not be destroyed intentionally but other supplies which cannot be evacuated are destroyed. The division and the engineer battalion are interested primarily in the denial of such items as military equipment and installations, military supplies, communication facilities (railroads and rolling stock, airstrips, bridges, highways, signal communication items), and public utilities (power-plants, reservoirs, and port facilities).

b. *Denial by Removal.* Evacuation of material is as much a part of denial operations as destruction. Evacuation must be started early and conducted in accordance with prepared priority lists. Every available means of transportation must be used to capacity, to save as much supplies and equipment as possible.

c. *Denial by Destruction.* All possible methods of destruction are used. The most common are fire, flooding or drenching, mechanical methods (such as breaking with a

sledge hammer or cutting with an oxyacetylene torch), and explosives (FM 5-25), including ADM and thermite incendiary grenades. So that material may be destroyed at the desired time, personnel to destroy each item are designated in advance; supplies necessary for the destruction are estimated and assembled at convenient locations; circumstances under which the destruction is to take place are definitively prescribed; and, if orders for destruction are to be issued, the means of transmission are provided.

d. Atomic Demolition Munitions. Atomic demolition munitions may be used in denial operations. Normally, the officer responsible for the execution of an atomic demolition mission will be the demolition guard commander. However, the responsibility may fall to the commander of the ADM firing party (see FM 5-26). The commander of the ADM firing party must be highly trained in all aspects of the ADM operations that are the responsibility of engineer personnel. He directs all operations at the emplacement site, takes emergency action in the event of a change of mission or misfire, and detonates the ADM on proper order. Engineer personnel prepare the emplacement site under the direction of the ADM firing party commander. This preparation may include providing appropriate access roads, installing antitank and antipersonnel minefields or other obstacles when ordered, camouflaging the area to avoid disclosure of the operations, providing immediate security, and providing communication facilities. Engineer personnel install the ADM in the emplacement and complete all preparation of the munition and site. Detailed information on the employment of atomic demolition munitions is contained in FM 5-26.

7-7. Field Fortifications

a. The defense is built around a series of organized and occupied tactical positions which are selected for their natural defensive strength, their contribution to the mission, and the degree of observation they allow. These natural positions are strengthened by field fortifications, in consonance with the fire plan

and the scheme of maneuver. Well planned and constructed fortifications should provide the desired degree of protection, and also bring the enemy under a maximum volume of effective fire as early as possible. Precautions are taken to conceal from the enemy the location of principal defensive elements. Concealment of real positions and the preparation of dummy and decoy positions normally proceed concurrently with other work. Plans normally provide for construction by phases, meaning that the protective construction proceeds from the minimum to the maximum practicable.

b. The siting and construction of field fortifications for the protection of troops are the responsibility of the individual unit commander involved. The staff engineer assists by preparing plans and orders and conducting technical inspection. Engineer responsibilities are primarily technical. The supervisory engineer personnel, however, are familiar with the tactical considerations affecting the organization of the ground. This allows them to give valuable technical assistance and advice. The engineer's primary responsibilities in the construction of field fortifications are to—

- (1) Furnish technical advice and assistance.
- (2) Accomplish large-scale excavation and backfilling.
- (3) Increase the effectiveness of extensive emplacements through the creation of protective obstacles.

c. Construction priority of weapons emplacements, command posts, and other shelters provides for efficient use of available time, personnel, tools, and materials. It insures that maximum value is derived from the time and labor already expended, if the area is attacked before construction is completed. Local materials and expedient construction are used to reduce logistical requirements. Construction work to strengthen the position is continued during the entire period of occupancy. For types of fortifications, see FM 5-15.

7-8. Camouflage

The basic principles of camouflage in an offensive operation are followed in a static or

defensive situation (FM 5-20). The responsibility for camouflage rests on the commander. However, all troops must be trained in and continuously apply basic camouflage principles, particularly in the concealment of themselves, their materiel, and their positions. Technical advice and assistance are responsibilities of the engineers. The division engineer under the general staff supervision of the division G2, normally is responsible for camouflage planning, in coordination with the operations and supply sections. In a fast moving situation, time may not permit the extensive use of artificial concealment materials, and troops must then use the terrain to maximum advantage for concealment. Engineers can advise and assist in this function.

7-9. Engineer Work in the Division Rear Area

Priority for engineer effort in the division rear area is in support of the reserve. Blocking positions in the rear of the forward defense area are planned by the division and are prepared by maneuver battalions of the reserve, assisted by engineers, or they may be prepared by engineers under guidance of the commander of the unit which will occupy the position. Positions are selected and organized to prevent major penetrations from securing lightly held or exposed flanks. The positions may be occupied by elements of the division reserve. Full advantage is taken of natural terrain features. Positions are prepared for all around defense. Emphasis is placed on defense against armored attack and possible nuclear strikes. Engineers play an important role in the preparation of rear area defense and in the construction of alternate positions. Engineers in the rear area normally are in the general support and perform all types of engineer work. Typical assignments for engineer troops located in the rear area include—

a. Road and Bridge Maintenance (Construction and Repair). In the division rear area, there will be a continual buildup and replenishment of supplies and equipment. This results in an added amount of traffic on the road network. Since all defensive operations are de-

pendent upon the mobility of units and supplies, it is of great importance that the roads and bridges be kept open at all times.

b. Command Posts. Division and brigade command posts must attempt to avoid presenting profitable targets for enemy nuclear weapons. Such command posts must be dispersed, concealed, and sufficiently dug in to prevent excessive damage from nuclear attack. The necessity for alternate command posts for division as well as brigade headquarters will increase appreciably the workload of the engineers. The preparation of positions and obstacles to provide a base of security for the division command post should be coordinated with the division provost marshal and the military police security platoon leader.

c. Division Artillery Positions. Engineer effort may be required to assist in preparation of artillery positions for rapid displacement of artillery units.

d. Water and Water Points. The operation of water points is the responsibility of the engineer battalion S4, but the engineer companies assist in site preparation. This assistance includes clearing, construction of access roads, and necessary leveling and excavation to make the sites suitable.

e. Mine Removal. If the defense is to be undertaken in an area previously occupied by the enemy, minefields may have been breached. As the buildup of the area increases, it may be necessary for engineer units to enter these mined areas and remove or destroy the mines still in place.

f. Prisoner of War Collecting Points. Although military police are responsible for controlling prisoners of war, engineers may be required to construct prisoner of war facilities.

g. Air Landing Facilities. It will be necessary to prepare landing facilities for aircraft (TM 5-330). This generally will consist of clearing an area large enough to receive the aircraft, and limited leveling and excavation to make the ground trafficable for the aircraft. Examples of this type of work include clearing of brush, trees, or telephone lines

from the sides of a road so that the road can be used as a landing strip, and filling craters or removing vegetation from an area of sufficient size to allow helicopter landings.

h. Preparation of Installations. Preparation of support command installations in the divi-

sion rear area may require engineer effort. This work will include emplacements for signal communications equipment, supplies, and preparation of areas for the medical battalion to receive mass casualties. The supply and transportation and maintenance battalions may also require assistance in preparing their areas.

Section III. DEFENSE AGAINST NUCLEAR ATTACK

7-10. Application

Although this section is in the chapter on defensive operations it is applicable generally to all forms of tactical operations, not only defensive.

7-11. Engineer Effort

Division headquarters will control the engineer effort in defense against nuclear attacks. Such engineer work will be the measures taken to reduce the vulnerability of friendly forces to nuclear attack and to facilitate their recovery after the attack. These measures include duplication, dispersion, deception, camouflage, and construction of protective shelters before a nuclear attack. They include reconstruction and assistance in decontamination and area damage control measures after the attack. The engineer effort expended on each task will be determined by the situation and the importance of the installation or facility to the division mission. The commander should weigh these measures in deciding on the employment of the engineer units in a damage control role. Nuclear defense, which includes radiological defense, is defined as the protective measures taken to minimize casualties and materiel damage from the blast and thermal and nuclear radiation effects of a nuclear weapon. It is interpreted to include measures such as—

a. Training and distribution of personnel with special reference to radiological specialists.

b. Preparation and maintenance of fixed and portable structures and equipment.

c. Teaching defense techniques and procedures, including use of detection equipment;

protection or removal of exposed personnel; and decontamination of personnel, equipment, structures, or terrain.

7-12. Prestrike Operations

Each commander is responsible for construction of installations required for radiological defense. He considers the protection to be gained through special types of construction, the location of new shelters, and special command posts. Additional prestrike tasks include the following, as time permits:

a. Survey of area for suitable shelter locations.

b. Disperse unit personnel, equipment, and supplies consistent with operational practicability.

c. Cover essential equipment and supplies with canvas or other material for protection against contamination.

d. Organize unit medical, rescue, and evacuation teams.

e. Organize a radiological defense warning system.

f. Prepare a radiological defense SOP based upon that of the next higher headquarters.

g. The division engineer is responsible for:

(1) Selection of alternate sites for water points.

(2) Selection and preparation of alternate bridge crossing operations.

7-13. Poststrike Operations

The engineer mission in case of a nuclear attack is expected to be essentially the same as for other types of attack, but to be com-

plicated in practice by the destructive effects of nuclear weapons and the additional hazards of residual radiation. Rescue squads will be organized and equipped to remove casualties and render first aid. Labor and equipment squads will be organized and equipped to clear debris, search for casualties, assist in decontamination, and evacuate materials. The removal of victims from the wreckage of collapsed buildings will often be a task requiring structural knowledge and engineering judgment. After the burst, engineers may be required to—

- a.* Perform first aid, rescue, and evacuation tasks.
- b.* Prepare personnel and equipment decontamination stations.
- c.* Make and post radiological contamination markers for contaminated areas.

d. Decontaminate vital areas or evacuate supplies to safe areas.

e. Fight fires.

f. Clear debris and trees blowdown from essential routes to facilitate relief, supply, and evacuation.

g. Remove or cover radioactive materials in contaminated areas.

h. Assist in the extrication of units or elements trapped by blowdown, rubble, and fire.

i. Produce potable water.

j. Provide information to division traffic headquarters on the status or routes to include estimates of times required to reopen closed routes.

k. Perform other special and general engineer tasks as required.

Section IV. ENGINEER RESPONSIBILITIES IN RETROGRADE MOVEMENTS

7-14. Retrograde Movements

a. Introduction. Retrograde movements are movements to the rear or away from the enemy, and are classified as withdrawals, delaying actions, and retirements (see FM 61-100).

b. Conduct. Within a division in contact with the enemy a combination of these retrograde operations may be conducted simultaneously or in sequence as one operation develops into another. Such operations may be forced by enemy action or may be executed voluntarily. In either event, the operation must be approved by the higher commander. A well planned, well organized, and aggressively executed retrograde operation provides opportunities for inflicting heavy damage to enemy troops and material. In the conduct of a retrograde operation, the division will employ a combination of offensive, defensive, and delaying tactics. Because of their inherent characteristics of tactical mobility and extensive communications, the armored and mechanized divisions can cover a wider front in retrograde operations than the infantry division.

7-15. Purpose

Retrograde movements are conducted to accomplish one or more of the following:

- a.* To harass, exhaust, inflict punishment upon, resist, and delay the enemy.
- b.* To draw the enemy into an unfavorable situation.
- c.* To permit the employment of all or a portion of the command elsewhere.
- d.* To avoid combat under undesirable conditions.
- e.* To gain time and avoid fighting a decisive engagement.
- f.* To disengage from battle.
- g.* To conform to movement of other friendly troops.
- h.* To shorten lines of communication.

7-16. Withdrawals

Withdrawals may be executed either during daylight or at night and may be forced or voluntary. Night or voluntary withdrawals are favored over daylight or involuntary withdrawals since the former are conducted without direct enemy pressure. Night or voluntary

withdrawals provide freedom of action, facilitate deception, and reduce the effectiveness of observed enemy fires. A daylight withdrawal under enemy pressure is avoided if possible, because observed enemy fires may result in heavy casualties and loss of freedom of action. Regardless of the type withdrawal being conducted, contact is maintained with the enemy forces.

7-17. Delaying Action

The division accomplishes a delaying mission by delay on successive positions, delay on alternate positions, or by a combination of the two techniques. Continuous delay is inherent in each of the techniques and requires constant contact with the enemy by some portion of the delaying force, including the use of long-range firepower and maneuver, to cause him to deploy, reconnoiter, maneuver, and take other time-consuming measures. Delay on alternate positions can only be used when the division can accomplish its mission and occupy two positions simultaneously. This normally will occur when the frontage assigned the division is relatively narrow. Delay on successive positions may be used when a relatively wide front is assigned to the division. In either technique, continuous delay is sought on and between positions. Delaying positions should be far enough apart to cause the enemy to regroup prior to continuing the attack from one position to the next. Delaying positions are sought which incorporate the following.

- a. A series of parallel ridges across the lines of hostile advance.
- b. Unfordable streams, swamps, lakes, and other obstacles on the front and flanks.
- c. High ground with good observation and long-range fields of fire.
- d. Concealed routes of withdrawal.
- e. A road net and/or areas providing good cross-country trafficability.

7-18. Retirement

A retirement may be made following a withdrawal or when there is no actual contact with

the enemy. When a withdrawal precedes a retirement, the retirement begins after the main forces have broken contact with the enemy and march columns have been formed. Security for the main body is provided by advance, flank, and rear guards. When the retirement is preceded by a withdrawal, a strong rear guard will be required to employ delaying tactics to delay the advancing enemy and to prevent interference with the movement of the main body.

7-19. Engineers in Retrograde Operations

a. Engineers may be placed in support of, or attached to, combat maneuver units as the situation demands. Execution of the division barrier plan, construction of obstacles and rearward positions, and road maintenance may dictate a centralized engineer effort. The requirements for engineers by units in contact with the enemy may dictate attachment of engineers to them. Brigades may further place engineers in support of battalion task forces. Unless additional engineer support is furnished from outside the division, attachment of engineers to combat units may decrease the effectiveness of the engineer effort.

b. One of the most important functions of the engineers will be to provide advice and assistance in the overall formulation and implementation of the barrier plan. Barriers (obstacles) are used by the retrograde commander to delay the enemy or canalize him into areas where he can be destroyed with nuclear or non-nuclear fires. Well-planned and widespread use of barriers, to include chemical contaminated barriers, assists in gaining time and in avoiding close pursuit. Subsurface or surface nuclear demolitions may be employed to create craters and contaminated areas, and to slow or impede the enemy's advance (see FM 5-26). Barrier plans are coordinated with higher headquarters to prevent interference with future operations. The barrier plan is developed and prepared as an annex to the operations order (plan) by the division engineer in coordination with the G3 (responsible staff officer).

- c. Detailed plans are prepared for demoli-

tions along enemy avenues of approach and those routes which lead into the division sector. Particular attention is given to the destruction of bridges and tunnels. Demolitions are placed in defiles and on routes traversing natural and artificial obstacles as well as lateral routes through the division sector. Demolition plans include—

- (1) Provisions for placing and firing the necessary demolitions.
- (2) Adequate guards to prevent premature firing of charges or seizure by enemy infiltrators.
- (3) Fixed responsibility for the destruction of bridges.
- (4) Schedule for destroying bridges no longer needed by friendly forces.
- (5) Covering by fire, including chemical or nuclear fires, those obstacles created by demolitions or other means.

d. The destruction of bridges is of major importance to the retrograde force commander.

Care is exercised to insure that bridges are not destroyed prematurely or that they are not seized intact by the enemy. To accomplish this, responsibility for destroying bridges within his sector is delegated to the tactical commander. This delegation of responsibility is often subject to specific restrictions imposed by the higher commander. A demolition firing party and a demolition guard are designated for each bridge to be destroyed. The guard commander has the authority to destroy the bridge, subject to conditions established by the higher commander. A list of all units that are to use the bridge is furnished the guard commander. Each unit commander notifies the guard commander when his unit has cleared. After the main body has crossed, the majority of the bridges in the sector are destroyed. Certain predesignated bridges are left for use by security elements. The demolition guard commander is responsible for destroying the bridge to prevent its capture by the enemy, but will do so only in accordance with the provisions of the demolition plan (app D).

CHAPTER 8

ENGINEER REORGANIZATION FOR COMBAT

8-1. Introduction

The divisional engineer battalion, or any element thereof, engages in combat when—

- a. The enemy prevents access to the unit's job site.
- b. The enemy attempts to drive the engineer unit from a job site.
- c. The enemy prevents delivery of supplies.
- d. Enemy action forces a combat role. This may develop in several ways—
 - (1) The unit commander is forced into a combat role in order to save the unit.
 - (2) Enemy action forces the unit to fight in order that the higher command can accomplish its mission.
 - (3) Because of the situation, the major commander decides to commit the engineer unit.

8-2. Contingency Planning

An engineer battalion usually has its combat engineer companies in support of each committed brigade with elements of the bridge company and the headquarters company's equipment platoon supporting these companies. The remaining "operational" elements of the battalion are committed throughout the division area in general support of the division. Consequently, it is difficult to reorganize the battalion as a unit for combat. However, the battalion and each combat engineer company must plan for such a contingency and for commitment in combat as separate elements with the supported forces. These contingency plans are established in the battalion and company standing operating procedures (SOP) and are kept current based on the unit's current and anticipated missions and actual status. In the development of these plans, the battalion and

each company coordinate with the next higher headquarters and the supported force.

8-3. Employment

It it becomes necessary to employ the engineer battalion or its elements in a combat role, the unit must be prepared to execute this mission with the minimum amount of delay. Engineer elements should be committed as a unit to preserve unit integrity. The major force commander makes the decision to commit engineer units to a combat role. Some situations where an engineer unit may be committed to a combat role are—an overextended defensive area; a sudden enemy penetration or envelopment; an enemy airdrop or guerrilla activity in a rear area; or a need to relieve a combat force that must be committed to a more decisive combat role elsewhere. The major force commander will commit the engineer unit only after careful consideration of the following factors:

- a. The seriousness of the situation—will the enemy force be able to affect the command seriously if the engineer unit is not committed?
- b. The loss of engineer support—can the command afford the temporary loss of engineer support?
- c. Strength of the engineer unit—does the engineer unit have enough personnel to be effectively employed?
- d. Support to the engineer unit—will the mission be of an offensive or defensive nature, and what fire and logistical support can the engineer unit expect to receive from adjacent and higher units in carrying out its mission?

8-4. Types of Missions

An engineer unit may receive an offensive or defensive mission. However, it has less combat

effectiveness than an infantry unit of similar size because it has less equipment and fewer supporting weapons. Also an engineer unit undergoes less extensive infantry combat training. In the defense, to compensate in part for these disadvantages, an engineer unit is assigned a smaller frontage than an infantry unit of corresponding size. Additional firepower and fire support must be furnished by the force commander.

a. Offensive. The divisional engineer battalion might receive a mission to assist other combat forces in securing an objective of critical importance to the overall operation, or to destroy an enemy stronghold in the division zone, such as a small bypassed enemy unit—but this type of commitment is rare.

b. Defensive. The defensive type mission is the one most commonly assigned to division engineer units. The major force commander should allow time for the engineer unit to prepare for this mission. Time is needed to coordinate the proper type of support and to move nonessential personnel and equipment to a rear area where they will not be captured or destroyed by the enemy force. When ample warning time is available to the engineer commander, he prepares his unit for battle in the same way as any other combat force commander.

8-5. Preparation for Combat

Commitment of the engineer battalion in a combat role normally is limited to headquarters company and the combat engineer companies. The bridge company usually remains intact, subject to call by the division engineer, for assignment to division engineer missions. When modified for combat, the engineer company is capable of furnishing command and combat elements. Normal organization is changed to provide effective use and control of crew-served weapons, for security of equipment not needed for combat, and for the requirements of command, communication, and supply in combat. The extent of modification for combat varies with the size of the unit, the time available, and the mission. When engineers are committed to a combat role, there

usually is time to make the necessary initial changes before meeting the enemy. The battalion, battalion headquarters, headquarters company, and the engineer companies are each organized into forward and rear echelons. The forward echelon consists of sections and units to accomplish the combat mission. The rear echelon includes all of the equipment and personnel not essential to the mission. The number of personnel assigned to the rear echelon is the minimum necessary to maintain the mobility of the rear echelon, provide for its local security, and perform essential support functions. The rear echelon moves to a rear area designated by the commander.

8-6. Fire Support and Communications

Engineer units normally require additional fire support when committed in a combat role. Fire support is best provided when the engineer battalion is attached to the supported force and is employed as a part of it. The force commander then is responsible for furnishing supporting fires. Forward observers from artillery and mortar units join the engineer units as they would an infantry unit. If the battalion is committed as a unit, the combat engineer vehicles from the companies can be grouped to be employed as directed by the battalion commander. The engineer unit enters the radio net of the organization to which it is attached. The use of prearranged signals is coordinated. In static situations, wire communication may be established. In addition, messengers and sound and visual signals may be used. Whenever possible, supporting artillery units should continue their wire net down to each deployed engineer company.

8-7. Suggested Guide for Reorganization for Combat

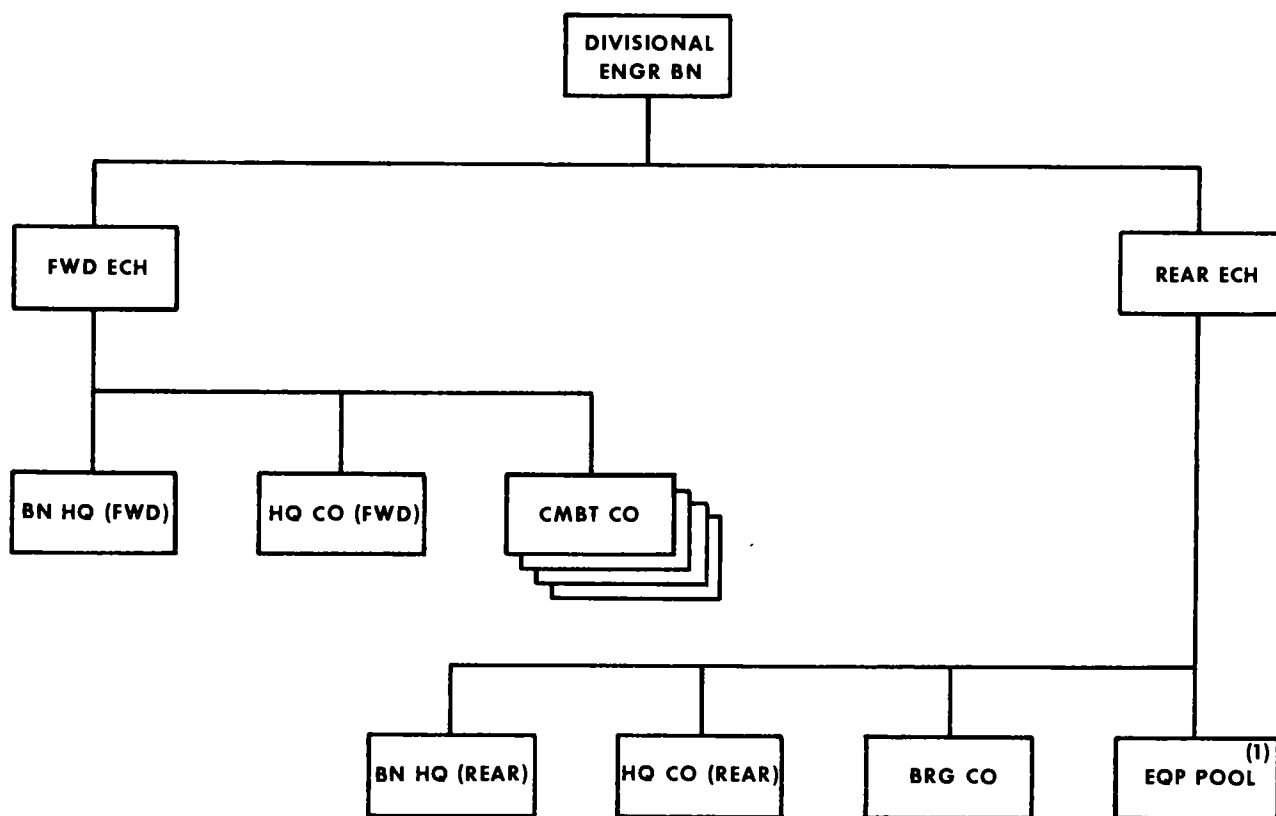
A definite plan, a part of the unit's SOP, must be established which will enable the unit to reorganize efficiently for combat. It is not desirable to establish a standard plan for all engineer units. Each unit has individual operating characteristics which must be considered in any plan for reorganization. Following is a suggested guide for reorganizing for combat.

a. *Divisional Engineer Battalion* (fig. 8-1).

- (1) *Forward echelon.* The forward echelon of battalion headquarters is under the immediate control of the battalion commander. It operates the battalion command post and provides the staff agencies necessary for the conduct of tactical operations.
- (2) *Rear echelon.* Members and equipment of the battalion staff sections which are not required for the combat mission become part of the rear echelon. The battalion rear echelon is commanded by the senior officer present, usually the S4.

b. *Headquarters and Headquarters Company* (fig. 8-2).

- (1) *Forward echelon.* The forward echelon of headquarters company consists of the personnel and equipment of battalion headquarters necessary to establish, operate, and defend the battalion command post. It is commanded by the company commander.
- (2) *Rear echelon.* The rear echelon is composed of personnel and equipment not required in the forward echelon. Available personnel and equipment of the company may be detached and used by the division engineer on engineer tasks elsewhere.



(1) Includes rear echelons of the engineer combat companies.

Figure 8-1. Divisional engineer battalion reorganized for combat.

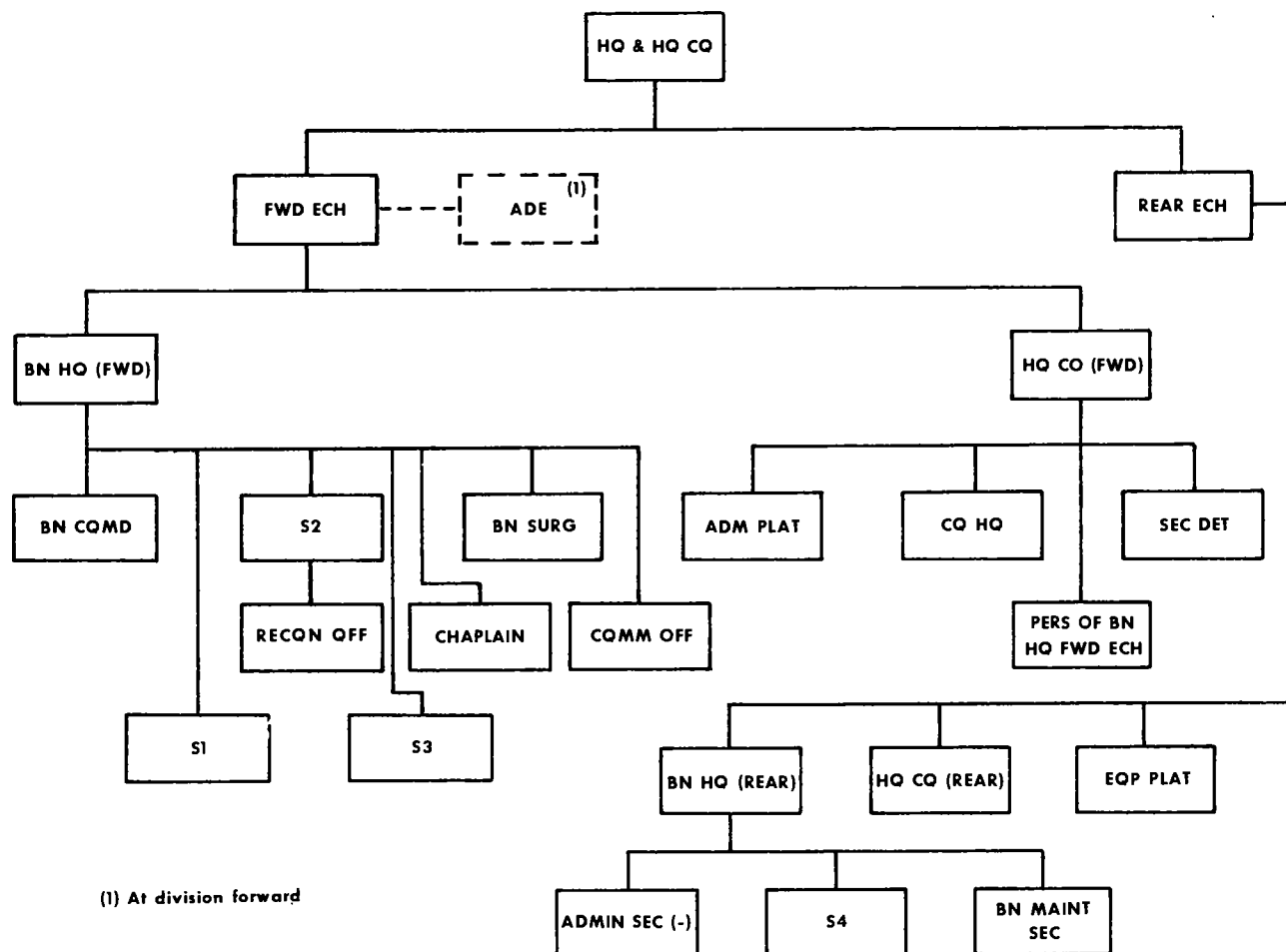


Figure 8-2. Headquarters and headquarters company reorganized for combat.

c. *Combat Engineer Companies* (fig. 8-3).

(1) *Forward echelon.* Personnel and equipment to accomplish the combat mission are formed into a forward echelon. Companies are modified so that each will have a headquarters and three combat platoons and, if desired, a separate combat engineer vehicle section.

(2) *Rear echelon.* The rear echelon moves to a rear area designated by the commander, normally with the remainder of the battalion rear. The mission of the rear echelon is to support the company's operation and to provide its own security.

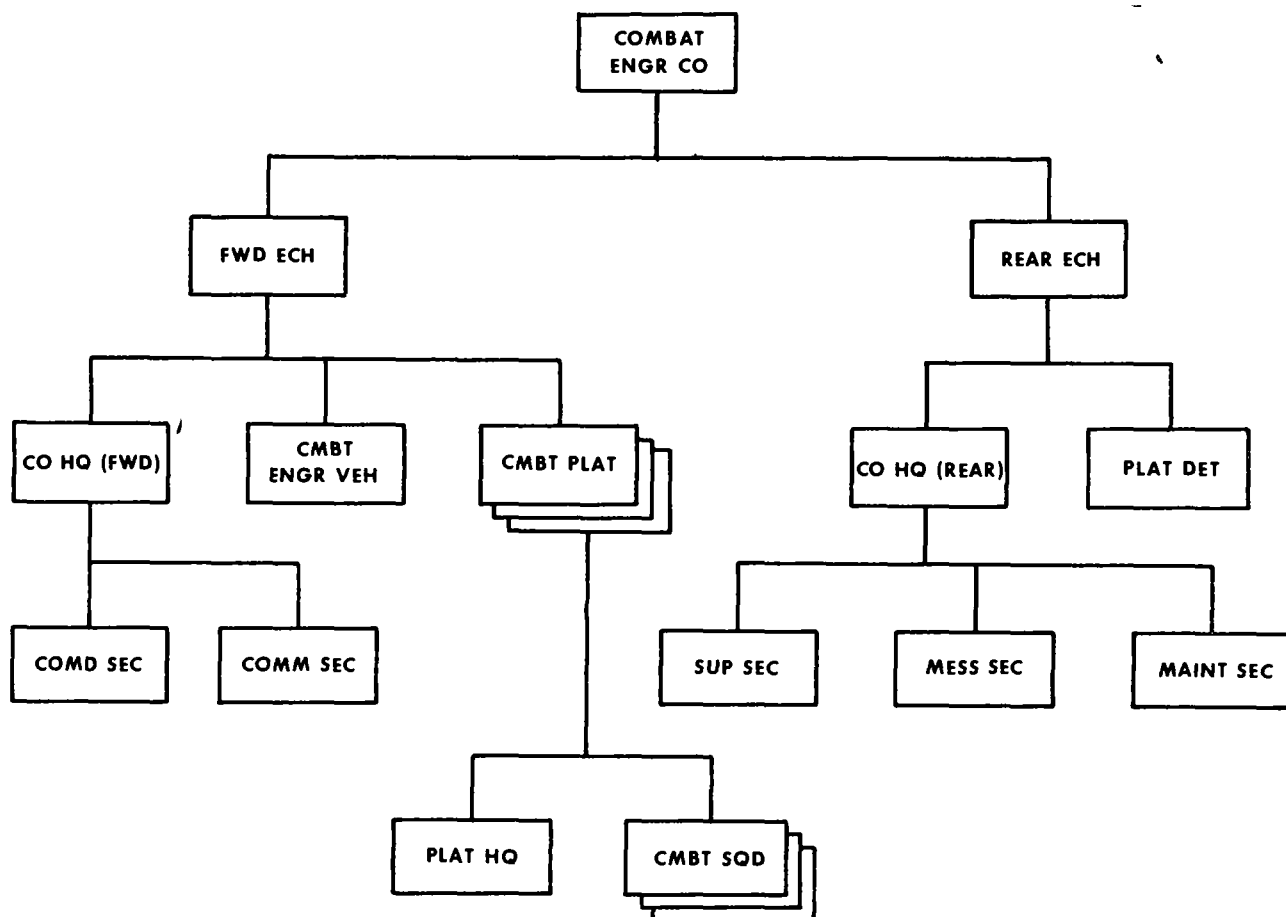


Figure 8-3. Combat engineer company reorganized for combat.

d. Bridge Company. The bridge company normally is not committed in a combat role. When the battalion is committed the bridge company normally moves to the rear and becomes a part of the battalion rear echelon. It

assists in providing part of the security element for that area. The division engineer may assign some essential engineer tasks to the bridge company.



CHAPTER 9

COMMUNICATIONS

9-1. Introduction

a. The division area communication system is installed, operated, maintained, and controlled by personnel of the division signal battalion. The system is composed of forward area signal centers and command signal centers interconnected through multi- and single-channel circuits, radio/wire integration stations, and signal messenger service (FM 11-50).

b. The division communication system normally will consist of—

- (1) Command signal centers at each echelon of the division headquarters (main, alternate and rear) and the support command headquarters, and three area signal centers in the forward area of the division zone. These signal center provide message center, messenger, cryptographic, teletype, telephone, and radio (excluding internal radio nets) service for all units in their vicinity supplemental to organic facilities.

Note. The material presented in this chapter is based on current TOE's. When TOE's are changed to reflect the application of Combat Developments Study "Field Army Requirements for Tactical Communications (TACOM)" a change to this manual will be published.

- (2) Multichannel communication links to interconnect the signal centers listed above, headquarters division artillery, and headquarters of each brigade.
- (3) A division ground messenger service and air messenger service (aircraft provided by aviation battalion), linking echelons of the division headquarters with the major subordinate commands of the division.

- (4) Radio wire integration stations at each signal center, except the one at division rear, capable of interconnecting mobile FM radio stations with the telephone system at signal centers.

c. The signal centers provide points of entry into the system for the supported headquarters, units, and installations to facilitate their use of trunk lines and channels in the system. For instance, if a company commander of an engineer company attached to a brigade has to request specialized equipment from the engineer battalion, he may enter the communications system through the signal center nearest him by either FM radio or telephone.

9-2. Responsibilities

a. Each commander is responsible for the establishment, operation, and maintenance of the communications system of his command. Effective communication is essential to the control of the battalion and its elements. The battalion uses a combination of radio, wire, visual, sound, and messenger communications.

b. Effective communication is a result of the joint effort of units concerned, even though one of those units has primary responsibility for establishing and maintaining communications with another. In the event of a communications failure, units concerned take immediate action to locate and eliminate the trouble and continue such action until contact is regained.

c. Battalion headquarters includes a communications section. The section operates under the immediate supervision of the communications officer, a member of the battalion staff. The communications section provides the following services:

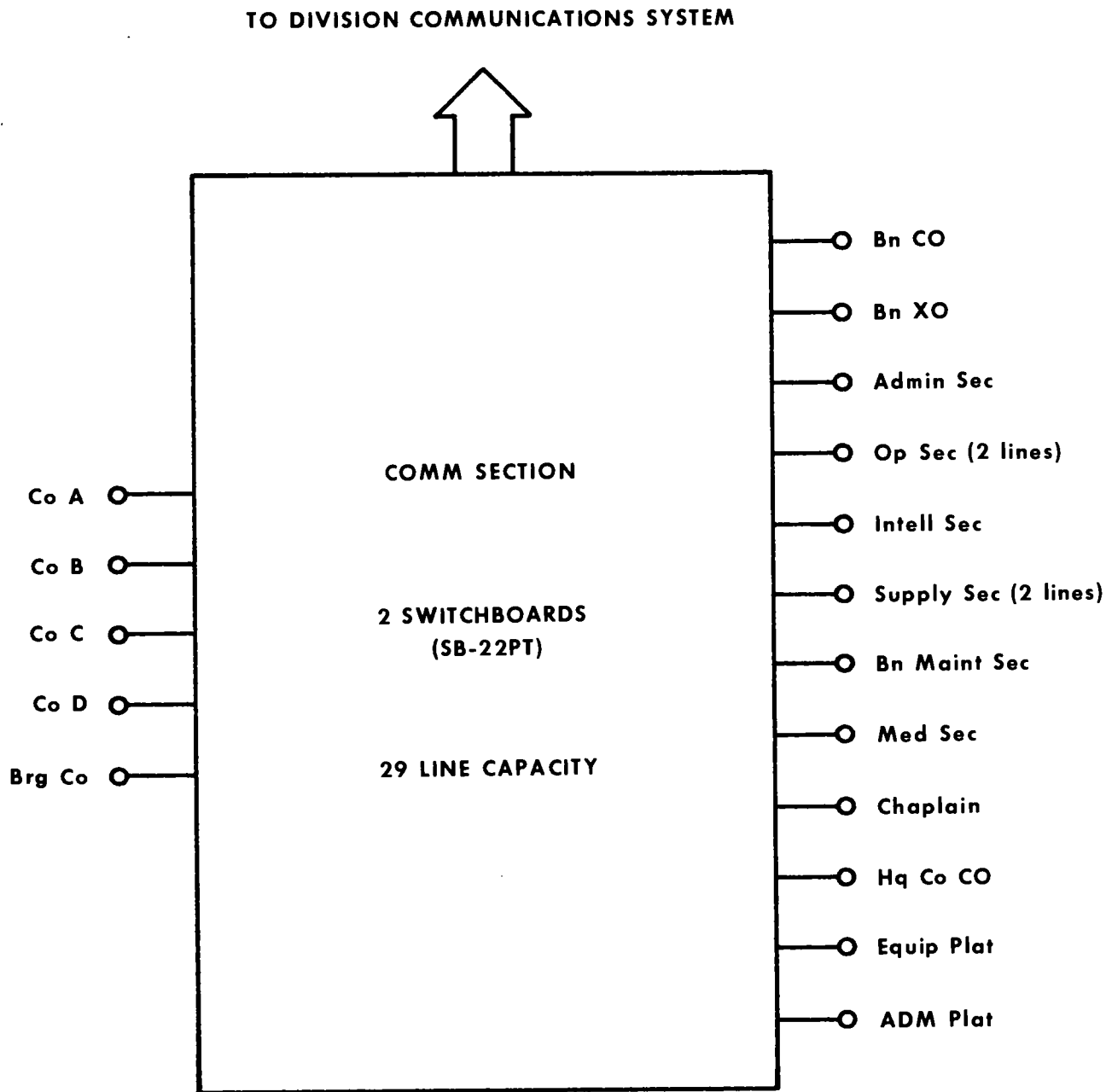


Figure 9-1. Typical wire net for divisional engineer battalion.

- (1) Supervises the operation of the battalion communications system.
- (2) Installs wire line to companies and staff sections.
- (3) Operates the battalion message center and switchboard and provides messenger service.
- (4) Operates panel displays and message pickup facilities.

- (5) Operates the battalion command net (AM) and the battalion commander's net (FM).
- (6) Monitors the division warning broadcast net (AM) and operates in the division general purpose net (RATT).
- (7) Provides organizational maintenance of communications equipment of headquarters company, and assists the companies in performance of their maintenance.
- (8) Provides facilities for encrypting and decrypting messages.

d. Each engineer company commander is responsible for the installation, operation, and maintenance of his portion of the communications system. He insures that his subordinates are properly trained to assist him in the execution of his communications responsibilities. The communications chief is the principal

assistant to the company commander in communications matters. Company headquarters is authorized personnel to perform the following tasks:

- (1) Providing organizational maintenance on communications equipment of the company.
- (2) Supervising the operation of the company communications system.
- (3) Installing wire lines to platoons.
- (4) Operating the company message center and switchboard.
- (5) Operating the company net (FM) and operating in the battalion command net (AM).
- (6) Monitoring either the engineer battalion commander's net (FM) or the supported organization commander's net (FM). Also monitoring the division warning broadcast net (AM).
- (7) Encrypting and decrypting messages.

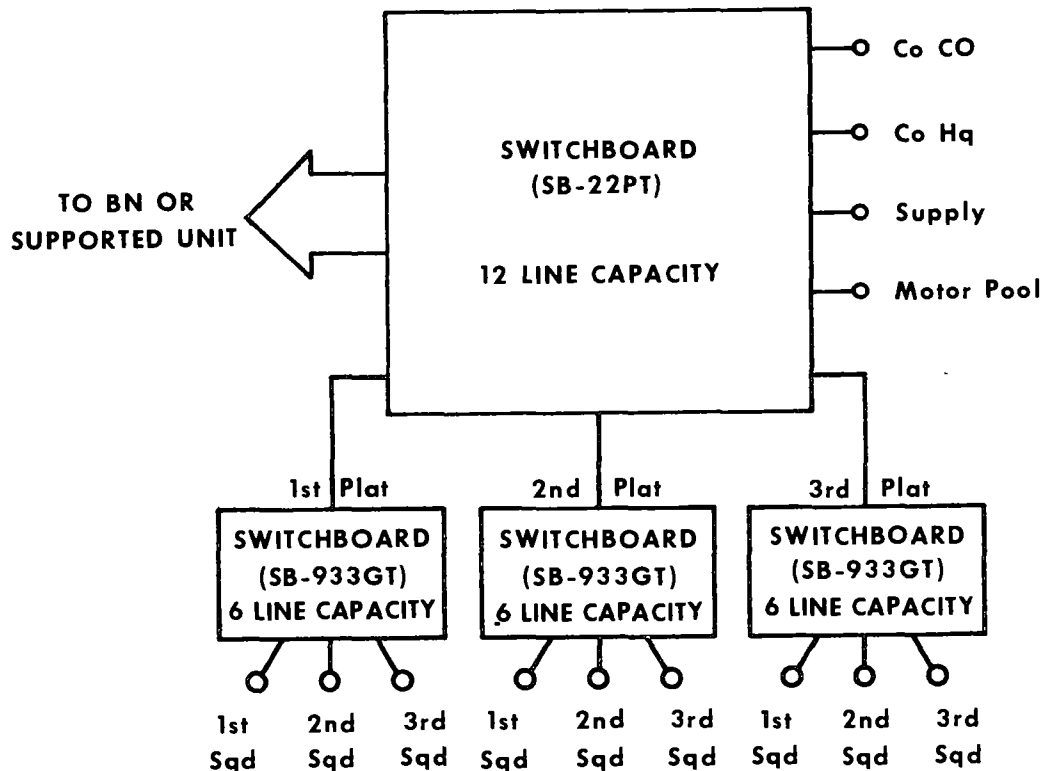


Figure 9-2. Typical wire net for combat engineer company.

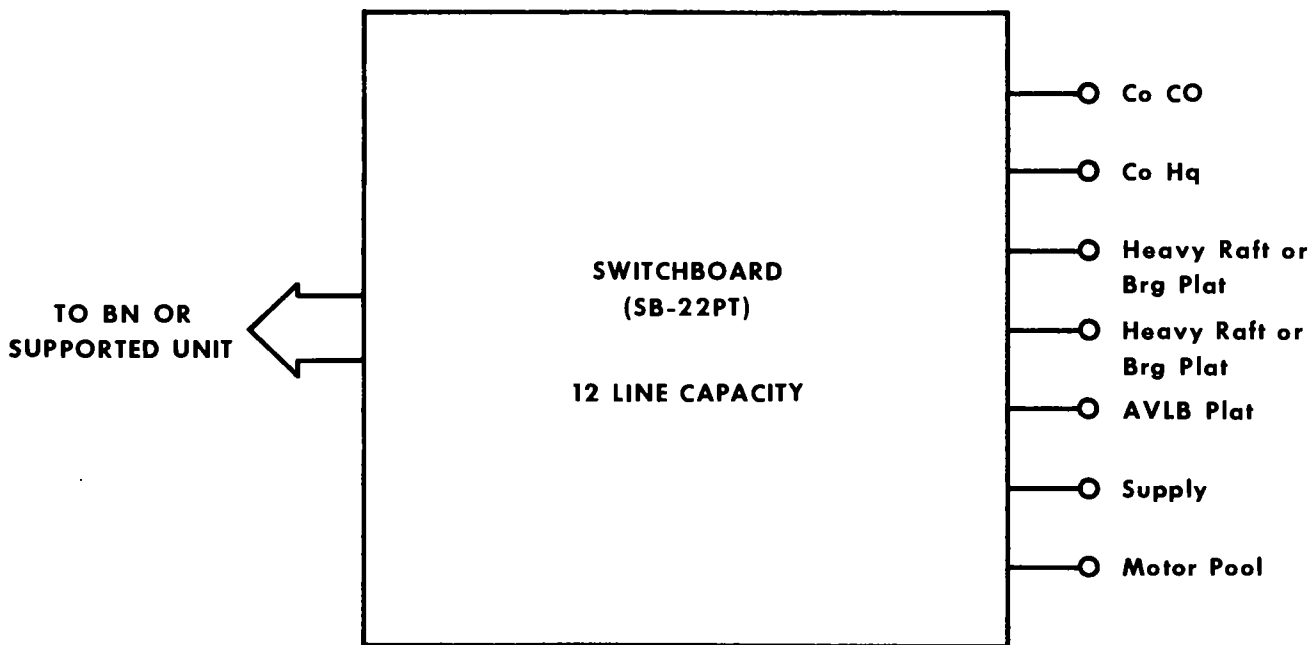


Figure 9-3. Typical wire net for bridge company.

9-3. Wire Communication

a. The widely dispersed operations of the engineer battalion preclude extensive use of organic wire for communication between elements of the battalion other than connections to the nearest division signal center(s). Typical wire nets for the battalion are shown in figures 9-1, 9-2, and 9-3.

b. The battalion communications section installs local telephones required for the operation of the battalion headquarters.

c. Engineer companies enter the wire system of the supported organization and the division area communications system. Wire communication is provided at worksites as required. Units use wire communication to control traffic through minefields and barriers.

9-4. Division Nets

a. *Divisional General Purpose Net.* This is an AM (amplitude modulated) RATT (radio teletypewriter) net which links division main and the engineer battalion. This net also includes division alternate, division rear, support

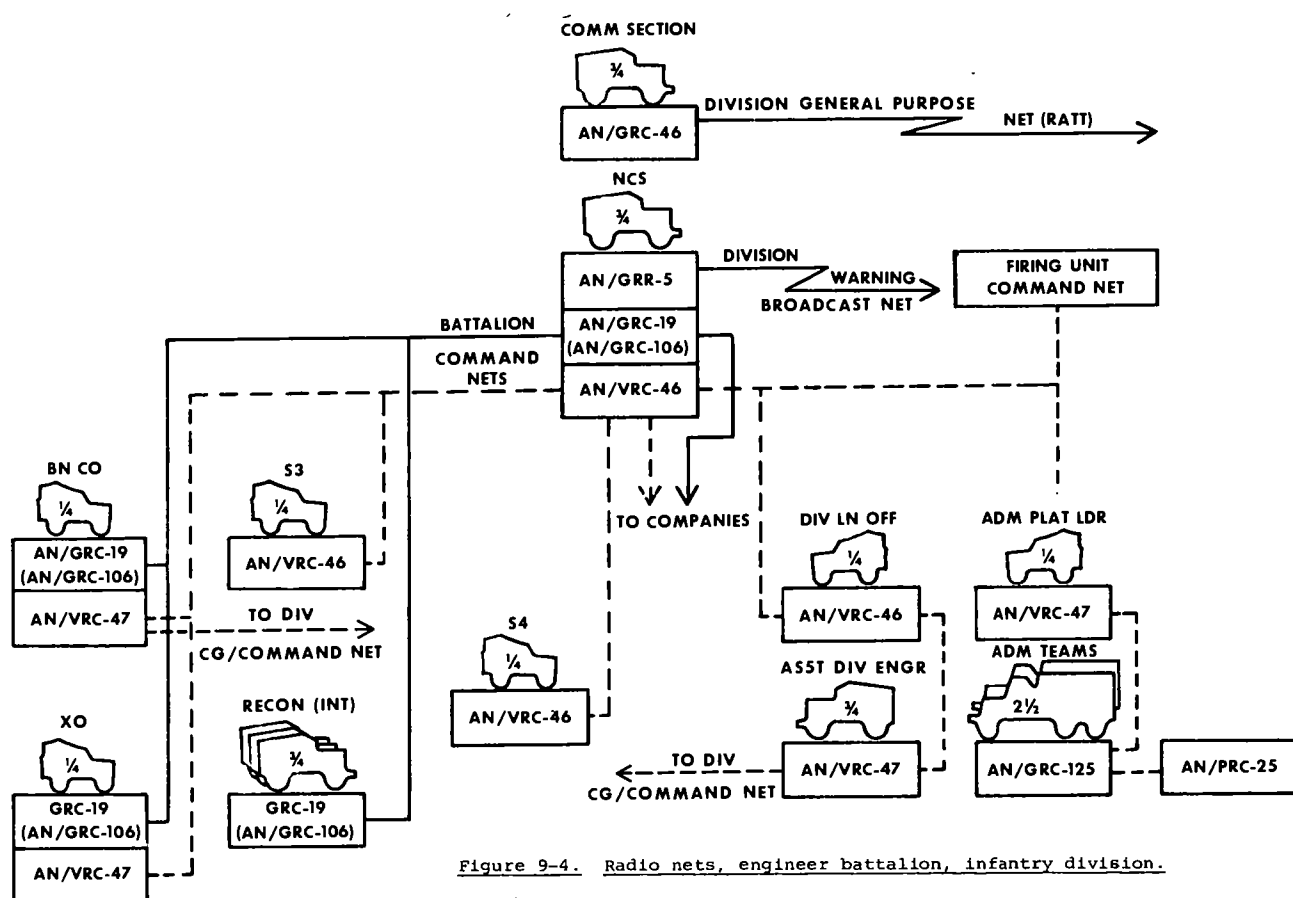
command, the aviation battalion, and the three forward area signal centers. The net control station (NCS) is at the division main command post. The communications section operates an AN/GRC-46 in this net.

b. *Division CG/Command Net.* This is an FM (frequency modulated) voice net. It links the division commander and staff and the commanders of all immediate subordinate units. The division engineer operates in this net and the assistant division engineer officer monitors it.

c. *Division Warning Broadcast Net (AM-Voice).* This net broadcasts air alerts, CBR attack warnings, radiological safety data, nuclear strike warnings, fallout warnings, and similar information of an urgent operational nature which applies to the division as a whole, or to major divisional elements, which need not be handled through command channels. Battalion headquarters and all companies monitor this net using the AN/GRR-5.

9-5. Battalion Nets

a. *Engineer Battalion Command Net (AM).*



legend
 — AM NET
 - - - FM NET

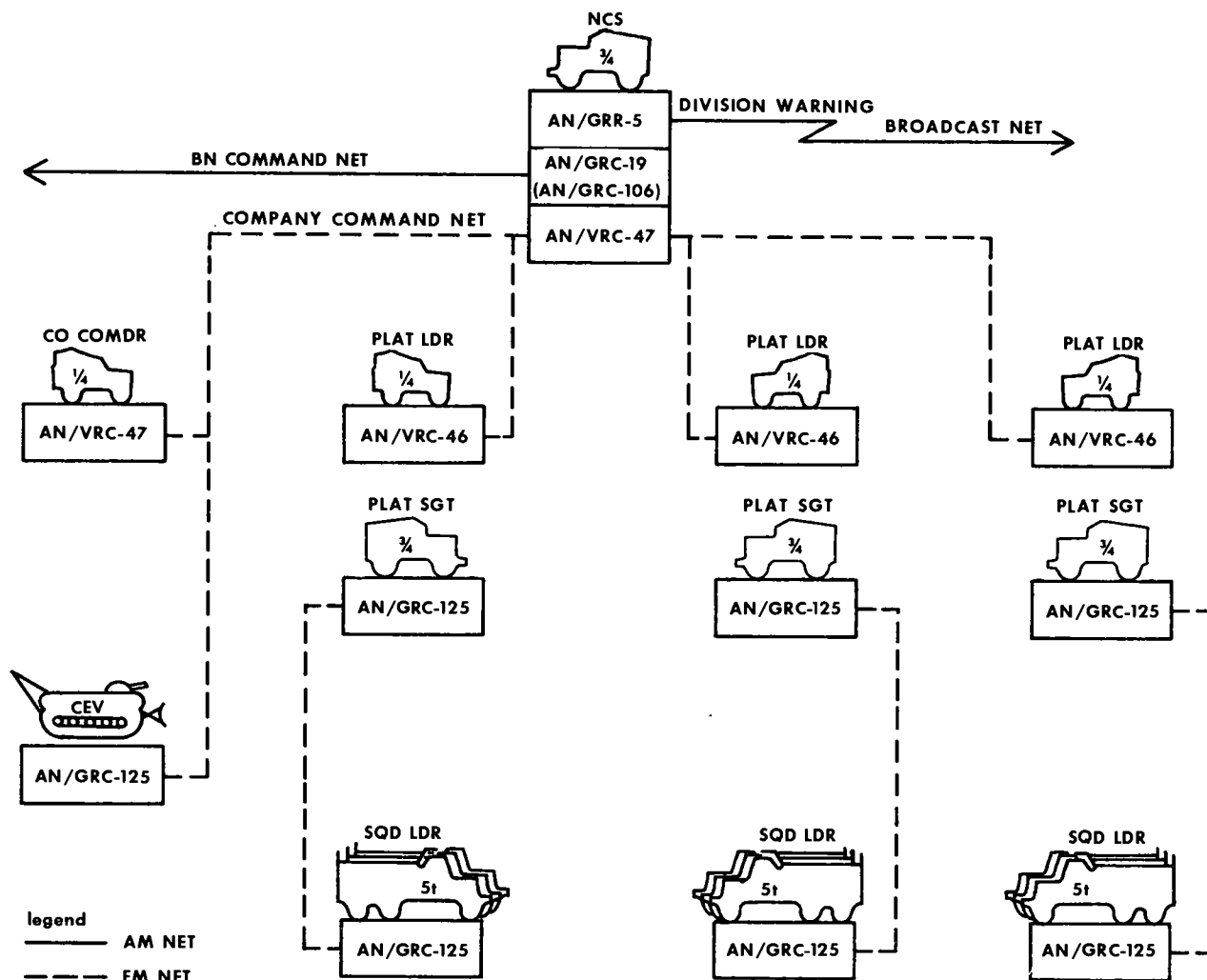
NOTE: AN/GRC-19 (STD B) WILL BE REPLACED WITH AN/GRC-106.

Figure 9-4. Radio nets, engineer battalion, infantry division.

The battalion command net links elements of the battalion over the ranges expected during normal operations. Command, operational, intelligence, and logistical traffic are carried on this AM net. It is the primary communication system for the battalion and may operate as a voice or continuous wave (CW) net.

b. Engineer Battalion Commander's Net (FM-Voice). This net is primarily for the use of the battalion commander for command and control. It may replace or augment the AM command net providing a voice link with each of the companies. When a company is support-

ing another organization, the company commander's and the company headquarters' FM radios normally monitor this net, and operate in the supported organization commander's command net (FM). In these situations the engineer battalion commander can maintain contact with detached companies through the battalion command net (AM). Figure 9-4 is a schematic of typical nets for the engineer battalion of an infantry division. The nets for engineer battalions of the armored and mechanized divisions are similar.



NOTE: AN/GRC-19 (STD B) WILL BE REPLACED WITH AN/GRC-106.

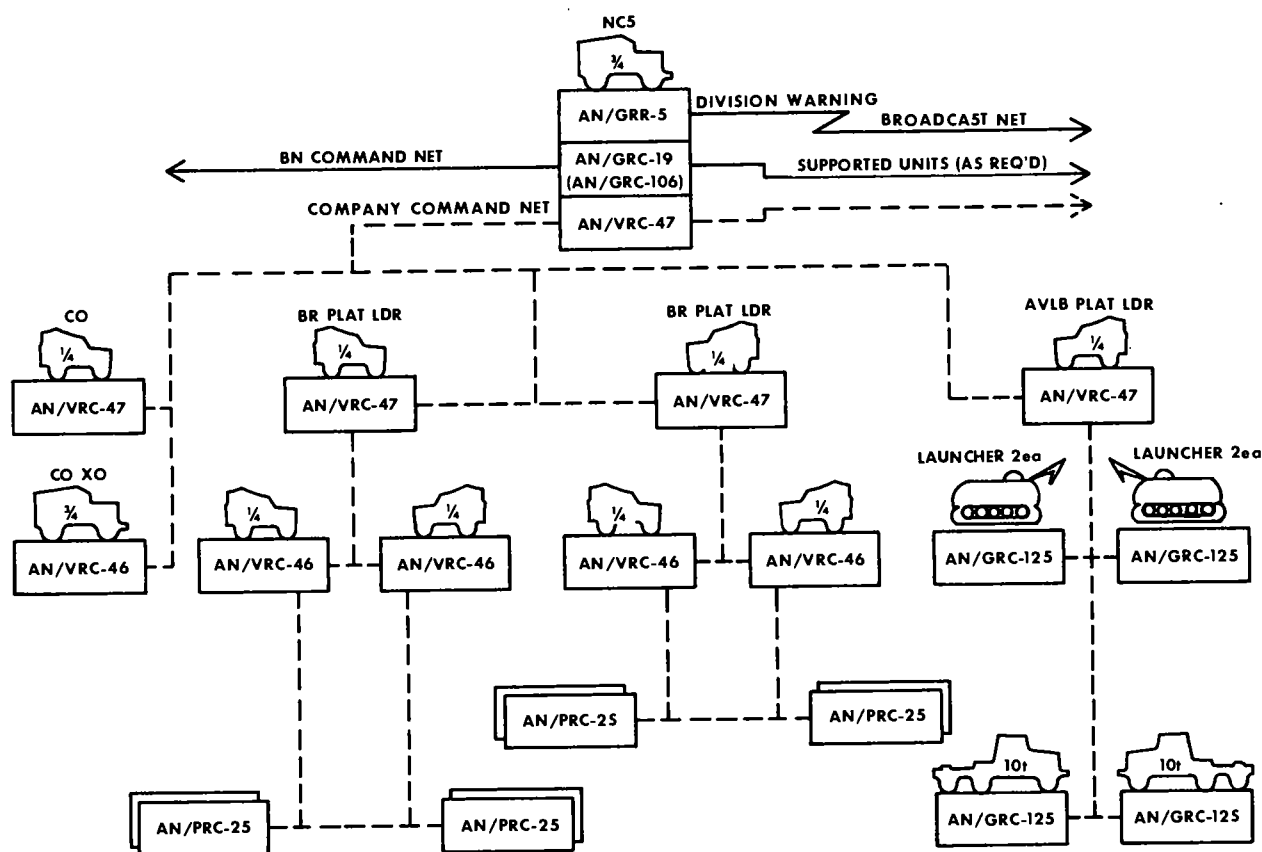
Figure 9-5. Radio net, combat engineer company, engineer battalion, infantry division.

9-6. Company Nets

a. Organic equipment of the combat engineer companies and the bridge company provides FM radios for internal command and control and for contact with the supported unit, an AM radio for maintaining contact with battalion, and an AM receiver for monitoring the division warning net. Figure 9-5 shows a typical net for a combat engineer company, engineer battalion, infantry division. Combat engineer companies of the armored

and mechanized infantry division battalions operate a similar net. Figure 9-6 is a typical net for the bridge company when equipped with the M4T6 or class 60 bridge. A slightly different net is used when the company is equipped with the MAB.

b. The communications section of the company headquarters operates the net control station (NCS) for the company command net. The FM radio set has one receiver-transmitter (RT) and one receiver. Normally, the RT is



legend
 — AM
 --- FM

Figure 9-6. Radio net, bridge company, divisional engineer battalion
 (equipped with M4T6 or class 60 bridge).

NOTE: AN/GRC-19 (STD B) WILL BE REPLACED WITH AN/GRC-106.

Figure 9-6. Radio net, bridge company, divisional engineer battalion (equipped with M4T6 or class 60 bridge).

used to control the company command net. The other receiver is used to monitor the engineer battalion commander's net or, if the company is in a support role, it monitors the supported organization commander's net. The transmitter frequency is switched as required.

c. The company commander's radio is identical to and used similarly to the one described above. With his radio, the commander maintains contact with his subordinate elements and monitors the battalion net or that of the supported organization commander.

d. The platoon communication capabilities are as follows:

- (1) The platoon leaders of the combat en-

gineer companies can operate in two nets. One is the company command net or, if the platoon is in a support role, the supported organization commander's net; the other is the platoon net.

- (2) The platoon leaders of the bridge company have radios similar to those in company headquarters. Employment of radios in the platoon is the same as in the combat engineer platoons.

e. The combat engineer vehicles of the engineer companies and the armored vehicle launched bridge launchers of the bridge company operate in their respective units' net, ex-

cept when in a support role, at which time they operate in the supported unit's net.

9-7. Radio Communication with Supporting Engineer Units

Nondivisional engineer combat units of the engineer combat groups use AM radios for their primary means of radio communication. A supporting engineer unit normally estab-

lishes and maintains communication with the supported divisional engineer battalion. This communication is established through either the division or army area communication system or the corps communications system, depending on the location of the supporting unit's headquarters. If feasible, the unit will operate in the divisional engineer battalion command net (AM).

CHAPTER 10

COMBAT SERVICE SUPPORT

10-1. Introduction

This chapter covers the method by which the divisional engineer battalion receives its combat service support within the division. Additionally, it covers the administrative, logistical, and maintenance areas of responsibility within the battalion as well as the battalion's responsibility to the division for production of potable water. The procedures described herein are intended as a guide and are subject to modification by appropriate regulations, directives, and policies of higher headquarters.

a. Division Support Command. The division has, as a major subordinate unit, a division support command which is organized on a functional basis to provide division level combat service support. It provides the following support to all elements of the division: supply, transportation of supply (less class V), direct support maintenance (except medical, cryptographic, and quartermaster air equipment), medical service, and miscellaneous services. Direct support maintenance of medical and quartermaster air equipment is provided by field army support command (FASCOM) units. Direct support maintenance of cryptographic equipment is provided by the division signal battalion. The division support command is an operational command directly under the division commander (see FM 54-2). Detailed functions and procedures pertaining to subordinate units of the division support command are covered in separate field manuals.

b. Division Administration Company. The division administration company, organic to the division support command, provides the necessary personnel and administrative services to sustain the division. This includes replacement support and a centralized personnel

service for all units assigned and attached to the division. It also provides direct support maintenance of electric accounting machine equipment. The company operates under the general staff supervision of the division G1. For details of the employment of the administrative company, see FM 12-11.

10-2. Administration

a. Administrative Responsibilities. Administrative responsibilities within the battalion include maintenance of unit strength; submission of reports; provision of morale and personnel services; discipline, law, and order; civil affairs; and collection and evacuation of the dead and of prisoners of war.

b. Maintenance of Unit Strength. The battalion adjutant forwards personnel requisitions to the division adjutant general, using as a basis vacancies existing in the companies. Receipt and processing of these individual and unit replacements into the battalion is supervised and coordinated by the adjutant. In the interest of morale and efficiency, replacements are retained in the division replacement section for the shortest practicable time, about 48 hours. They are moved to the battalion under battalion escort, using either unit or division transportation. Here they receive further indoctrination in the history, traditions, mission, and current situation of the battalion. Replacements are then moved to their assigned companies.

c. Submission of Reports. The companies informally furnish the battalion adjutant with necessary information for the company morning report, the personnel daily summary report, and, when required, a casualty and loss report. This information is relayed to the division administration company through the S1 section. The personnel staff NCO in the S1 section of battalion maintains close liaison

with the division administration company on these and other personnel matters. The battalion adjutant keeps the commander informed concerning personnel policies of higher headquarters and advises him on matters of personnel, morale, discipline, and esprit de corps within the battalion.

d. Morale and Personnel Services. The company commander is responsible for the morale and welfare of members of the company. He insures that leave and rest quotas are equitably allocated and that these quotas are filled when conditions permit. Emergency leaves are processed expeditiously in accordance with regulations and policies. He insures that all personnel are familiar with awards and decorations policies and that draft recommendations are promptly forwarded to battalion for preparation in final form. He insures that the pay and allotment of his men is correct, that mail is promptly delivered and properly handled, and that services such as legal assistance, welfare, army exchange, special services, and chaplain's assistance are made available and are properly utilized. The battalion adjutant assists the company commander in the foregoing responsibilities and insures the overall efficient operation of these services throughout the battalion.

e. Discipline, Law, and Order. The company commander is responsible for all matters pertaining to discipline, law, and order within the company. When appropriate, he exercises jurisdiction under article 15, Uniform Code of Military Justice, or prefers charges. Charge sheets and allied papers normally are prepared by clerks of the battalion S1 section from information furnished by the company commander. The battalion commander exercises summary and special courts-martial jurisdiction. He appoints court-martial boards for prompt disposition of cases occurring within the organization. The battalion adjutant maintains statistics on all absences without leave, stragglers, awards and punishments, court-martial actions, and other matters reflecting the status of discipline, law, and order within the command. He maintains records to insure that corrective action is taken when required.

f. Civil Affairs. The battalion S3 is responsible for the implementation of that part of the command civil affairs program pertaining to the battalion and coordinates these activities with the civil affairs elements in his area of operation. In the event the elements are not available, the S3 normally performs these functions. Therefore, the S3 must be thoroughly familiar with the policies and directives of higher headquarters concerning civil affairs operations and responsibilities. The primary mission of civil affairs during combat is to control the civilian population and to minimize interference with and obtain support for military operations. Support actions most likely required will be in the areas of civilian labor, public works and utilities, local supplies, buildings, and assistance in the control of displaced persons, refugees and evacuees. The company commander executes such civil affairs responsibilities as may be delegated to him by higher headquarters. He also insures that the utilization of civilians by his unit conforms to directives of higher headquarters.

g. Collection and Evacuation of the Dead. The company commander is responsible for collecting, identifying, and evacuating the dead, and for safeguarding their personal effects, while in the area of his control. The dead are identified as early and as fully as possible. Deceased personnel normally are evacuated to the battalion or supported organization's graves registration and evacuation point on available transportation. Personal effects are not removed from the body. Isolated burials are resorted to only as an emergency measure. When isolated burials are authorized, they are fully documented and reported promptly through graves registration channels. Details of graves registrations service are covered in FM 10-63.

h. Collection and Evacuation of Prisoners of War. The company commander is responsible for the proper handling of prisoners of war in accordance with the Geneva Convention of 1949 and for their evacuation to a prisoner of war collecting point. The adjutant prepares and supervises the executions of plans for the collection and evacuation of prisoners of war.

He must be careful to insure that these plans conform to the directives of higher headquarters and that they are sufficiently comprehensive. He coordinates with S2 for estimates on prisoners anticipated and facilities for any interrogation desired, and with S3 for necessary guards for prisoners while they are being evacuated. He coordinates with S4 for transportation to evacuate prisoners of war and with the battalion surgeon for evacuation of wounded prisoners.

10-3. Supply Functions

The principal functions of the battalion in supply are those of acquisition and evacuation. The battalion draws supplies from sources outside and makes distribution within the battalion. It also takes excess or unserviceable supplies from subordinate units and disposes of them through prescribed channels. The property responsibilities of the commanders are identical with those of commanders at all echelons. These command responsibilities are to insure that all property pertaining to the command is adequately administered, safeguarded, accounted for, and used.

10-4. Supply Responsibilities

a. Battalion Commander. The battalion commander discharges his supply responsibilities through the supply staff officer (S4). He insures that commanders of subordinate units properly conduct supply functions within their commands. He checks on the efficiency of supply operations through frequent personal inspections and by reports of inspections turned in by his S4. Immediate action to correct supply problems or discrepancies found as a result of inspections is the responsibility of the commander. He must insure that his staff accomplishes proper corrective action.

b. Battalion Supply Officer (S4). The battalion supply officer (S4) is responsible for closely supervising the supply activities of all subordinate units. He maintains informal accountability for all military property in the possession of these units. His operations support the tactical plan and are based upon the orders of higher headquarters. He has primary staff responsibility for the provision of ADM

and associated equipment and functions as the division water supply officer. He coordinates with the other staff sections of the battalion, the S4 or G4 of the next higher headquarters, and all supply establishments which are his sources of supply. He also coordinates and establishes liaison with all maintenance agencies which support the battalion. The primary functions of the S4 include—

- (1) Supervising the battalion supply section.
- (2) Maintaining liaison with installation supply and maintenance activities.
- (3) Training supply personnel.
- (4) Providing guidance to unit commanders on problems concerning supply.
- (5) Informing the battalion commander on the status of supply operations within all elements of the command.
- (6) Establishing and maintaining the property books and property records for the battalion and its elements. Duties of the property book officer are normally assigned to the supply warrant officer and include—
 - (a) Maintaining battalion and installation property books.
 - (b) Maintaining a transaction register to reflect all supply actions initiated by the battalion.
 - (c) Initiating all supply requisitions and turn-ins.
 - (d) Preparing adjustment transactions as required.
 - (e) Maintaining a file of vouchers to support property book and transaction register entries.

c. Company Commander. The company commander is responsible for the supply and administration of the company and any attached elements. He makes timely requests for supplies and distributes them. The company commander is assisted in these duties by the company officers, the first sergeant, the mess steward, the supply sergeant, and the motor sergeant. The specific responsibilities of a company commander in connection with property administration are quite extensive. He must—

- (1) Have in his possession, in serviceable condition, all items authorized his company.
- (2) Determine by frequent inspection that all prescribed items of authorized equipment in the possession of officers or enlisted men are on hand and serviceable.
- (3) Insure that all personnel, both officer and enlisted, are instructed in the proper methods of use, care, and maintenance of property, and that the instructions are followed.
- (4) Maintain individual clothing records, and such other records as are necessary to assure that the status of the property for which he is responsible is accurately reflected at all times.
- (5) Obtain acceptable vouchers to cover loss, damage, or destruction to property for which he is responsible, and process these vouchers in accordance with appropriate regulations.
- (6) Upon transfer of property responsibility to his successor, take joint inventory, and initiate action to adjust discrepancies.
- (7) When desired, designate one or more authorized representatives to receipt for property in his name. The representative may be any member of his command, commissioned, warrant, or enlisted. The fact, however, that property is receipted for by a representative of the commander does not in any way reduce his own responsibility for that property.
- (8) Assume responsibility for all government property under his control, whether receipted for or not.

d. Platoon Leader. The platoon leader is responsible for the equipment organic to his platoon. This equipment is issued to him on hand-receipt by the battalion S4. He inspects the platoon to see that it is properly equipped and that any shortages are replaced. In combat, he sees that the platoon is fed, and that supplies and materials are replenished. He informs the company commander of any dis-

crepancies and also reports them to the battalion S4. He checks on the timely delivery of replacement items.

10-5. Supply Procedures

a. Maps. Distribution of maps is accomplished by the supply and transportation battalion in accordance with priorities of allocations made by the G2, in coordination with the engineer battalion S2 and the division G3. Quantities are based on army tables of map allowances. The engineer battalion S2 obtains and distributes maps for the battalion.

b. Class I Supply. The battalion S4 forwards the battalion's requirements for class I supplies to the supply and transportation battalion. Normally, rations are delivered to the supply and transportation battalion, which breaks down the bulk supplies into unit lots. Depending on whether unit or supply point distribution is in effect, the supply and transportation battalion delivers rations to the engineer battalion area or the engineer battalion uses its organic transportation to pick up the rations at the prescribed class I distributing point. In either case, the battalion S4 breaks down and distributes rations to the company kitchens. When companies are in support of brigades and time and distance make this method of supply infeasible, the battalion S4 and the company commander concerned make appropriate arrangements with the division support command commander and the S4 of the supported brigade.

c. Class II and IV Supply. Class II supplies of all end items of supply of the various services, except medical supplies, are handled by the supply and transportation battalion. Class II and IV repair parts are supplied by the division maintenance battalion. Medical supplies are handled by the medical battalion. Class IV supply is accomplished in generally the same manner as class II. Engineer fortification materials normally are delivered by the army supply points supporting the division and are carried as far forward as possible without transshipment. The battalion S4 forwards the battalion requirements directly to the supply and transport battalion. Fast mov-

ing class II supplies are forwarded directly from the army supply points or depots to the division class II distributing point in the division support area or, where appropriate, directly to the battalion or company. Major items of equipment are delivered as requested by the division support command. Unit distribution of fast moving class II items directly to the battalion or to elements of the supply and transportation battalion operating with the brigade trains is desirable. Normally, a combination of unit and supply point distribution will be employed.

d. Class III Supply. The battalion S4 submits a periodic forecast for POL products to the supply and transportation battalion, indicating any change to the previously experienced supply rates. Class III may be delivered to the engineer battalion area by tankers of the supply and transportation battalion, or the engineer battalion may use its organic tankers to draw vehicle fuel from the class III distributing points which are established normally by the supply and transportation battalion in the division support and brigade trains areas. Individual vehicles moving to the rear on other tasks habitually replenish their fuel at division mobile filling stations.

e. Conventional Class V Supply. Ammunition requisitions for class V are prepared by the battalion S4 and are presented at the division ammunition office for authentication by the division ammunition officer (DAO) who normally is located in the division support area. He may be located at the army ammunition supply point (ASP). Class V normally is supplied through supply point distribution. The battalion does not carry a reserve class V. The only ammunition held in the battalion is in the company basic loads. Supply procedures are described in FM 9-6.

f. Special Class V Supply. Special ammunition supply procedures are described in FM's 101-10-3 and 9-6.

10-6. Water Purification

a. Water Production Teams. The divisional engineer battalion has five water production teams, with five water purification sets. It has

enough transportation, specialists, and helpers to operate the sets independently in establishing the water points required by the division. Normally one team is in support of each brigade, one is in support of the support command, and one is kept in reserve. Whether sent to a specific location or attached to an engineer company, the team operates alone. The location of the team determines how it gets its rations. It may be attached to an adjacent unit for rations; rations may be delivered to it by the engineer company to which it is attached or by headquarters company; or the team may prepare its own food on small cooking units.

b. Water Points. With the water purification sets, the water production teams establish the water points required by the division. Each unit of the division draws water from the point nearest it. Water point locations are reported to the supported brigade and to the engineer battalion headquarters. Battalion, in turn, reports these locations to the G4.

c. Sources of Water. Water usually is obtained from local sources determined by reconnaissance by S4 personnel. It is made potable with water purification equipment organic to the engineer battalion. When a source of water is not available in the division area, the division engineer has the staff responsibility for obtaining water elsewhere and stocking it at division water points.

d. Operation of Water Points. The tactical situation and the sources of water normally dictate the location and hours of operation of water point. Road nets, parking areas, and concealment are only slightly less important considerations. Normally, units are permitted to draw water at any time the water point is in operation. If water is limited in quantity or the demand excessive, units may be permitted to draw water only at scheduled times. Normally, the G4 establishes these schedules. Units should draw water as soon as practicable after the opening of the water point, as the water purification equipment must be dismantled before the next move in time to accompany the force which it is supporting. The battalion S4 is responsible for coordina-

tion of displacement of water points with the water point teams and with G4 for close-out times of old points and opening times and locations of new points; and for coordination with the battalion S3 for preparation of water point sites, with the division surgeon for water purity control, and with the provost marshal for traffic control.

10-7. Maintenance

a. Organizational Maintenance. The battalion maintenance section, under the control of the maintenance warrant officer, insures that the organizational maintenance requirements of the battalion are satisfactorily met. Incoming repair work is checked to see if proper operator maintenance has been performed and to determine the extent of repairs needed. Completed work is checked to see that equipment is in operating condition before it is released from the maintenance section shop. The battalion maintenance section also provides technical help to company motor pool personnel.

b. Direct Support Maintenance. The maintenance battalion of the support command provides direct support maintenance for all material except medical, electric accounting, quartermaster air, and cryptographic equip-

ment. Normally, one forward support company is placed in support of each brigade and operate in the brigade trains area. It provides direct support maintenance for engineer, ordnance, and signal equipment for the units in the area. The forward support company has a limited materiel recovery and evacuation capability. The main support company operates in the division support area, providing direct maintenance support to the division elements not supported by the forward support companies, and backup maintenance support to the forward support companies. The battalion maintenance section requisitions repair parts from the support company designated. The basis of requisition will be to replenish its prescribed load of repair parts.

c. Evacuation of Damaged Material. Units of the battalion are responsible for initial recovery of damaged equipment. Large items such as cranes or other vehicles may be evacuated to the brigade axis of evacuation or to division collection points. Small items are evacuated to the collection points. The main support company of the maintenance battalion operates the main division collection point and provides evacuation service for the materiel supported.

CHAPTER 11

TRAINING

11-1. Battalion Training

a. Introduction. The divisional engineer battalion trains to develop operating techniques that will enable it to function efficiently when integrated with other units of the division. Training never ceases. It is continuous before battle, during battle, and after battle. This chapter outlines the progress of training from the basic combat training of the individual to field exercises and maneuvers involving large units. As a general guide, training follows the Army Training Programs (ATP's) provided by Department of the Army. This training is designed to instill in every man a thorough knowledge of his job and the ability to work with others in a team. The ideal unit is well disciplined, thoroughly grounded in its mission, high in morale, and able to act promptly as a team. From the outset, each member of the battalion must be taught to perform under conditions of nuclear, chemical, and biological warfare.

b. Military Training. AR 350-1 sets forth the broad training policies and general guidance for all commanders charged with supervising or conducting military training in the Army.

c. Responsibility.

- (1) *Battalion commander.* The battalion commander is responsible for training the battalion to perform its primary mission. He plans, directs, conducts, and supervises the training of the battalion. He specifies the training which is to be conducted, within the outline provided by the directives and policies of division headquarters; assigns responsibility for the conduct of the training; insures that the battalion's perform-

ance and proficiency standards are in line with the standards of the Department of the Army; and procures and controls the use of training facilities, aids, and equipment. He issues the training memorandums necessary to implement his training mission.

- (2) *Operations officer.* The battalion operations and training officer (S3) prepares a training program and makes recommendations concerning training to the battalion commander. He also establishes battalion-level schools for officers, noncommissioned officers, and specialists. Members of the battalion staff assist in the planning and supervision of training which pertains to their specialized functions.
- (3) *Company commander.* The company commander is responsible for training his company in accordance with battalion memorandums and policies. Each company commander supervises the training of his organization.

11-2. Training Phases

a. Introduction. The training to be conducted and the time to be devoted to training during each of the five formal phases of training (phase (1) through phase (5), below) are prescribed in ATP and subject schedules. Individual and unit proficiency are tested at various stages of the training cycle by the use of army training tests (ATT). A unit normally starts the ATP cycle as soon as it is activated. It may repeat all or any part of this training at any time that it is judged to have fallen below the level of adequate operational proficiency, or when the turnover of personnel makes retraining of a major portion of the

unit necessary. Closely tied in to all engineer training is progressive instruction in combat principles, applied particularly in conjunction with security on the march, in assembly areas, and at worksites. Infantry methods and formations, prescribed in FM 7-11, FM 7-20, FM 7-30, and FM 21-5, should be used as guides; however, they must be adapted to engineer strength, armament, and organizations.

b. Army Training Program. The provisions of the ATP normally are followed in detail, but at times it becomes necessary for a commander to make modifications so as to conform to conditions of the training situation, or to facilitate the achievement of the training objective. A general breakdown showing the total time to be devoted to each subject in a 44- or 48-hour week is given in the ATP. This is the minimum training week. Night operations and field exercises ordinarily require much more time. Variables which affect training time and methods are:

- (1) Specific battalion mission.
- (2) Training status of the battalion.
- (3) Personnel situation.
- (4) Time available for training.
- (5) Weather.
- (6) Training areas and facilities.
- (7) Status of equipment.

c. Phases of Training. For convenient reference and to indicate definite stages of progress, training is divided into the following phases:

- (1) Basic combat training (for military personnel without prior military service).
- (2) Advanced individual training (includes specialist training).
- (3) Basic unit training.
- (4) Advanced unit training.
- (5) Field exercise and maneuver training.
- (6) Operational readiness training.

11-3. Basic Combat Training Phase

The objective of the basic combat training phase is to train the soldier in basic military subjects and the fundamentals of basic in-

fantry combat. In this phase, the recruit is taught how to adapt himself to army life and to live with, work with, and understand his fellow soldier. When this phase is completed, he understands why he is to fight; and his physical condition is good enough to enable him to fight effectively. He understands and is able to apply, under simulated or actual combat conditions, the principles of concealment and camouflage, cover, and movement, and is able to provide individual protective actions against aircraft, armor, and dismounted ground attacks. Further, he is able to participate as a member of a patrol or act as an individual scout or observer. He has qualified with his basic weapon, the rifle, and has fired for familiarization other weapons, including grenades.

11-4. Advanced Individual Training Phase

In this phase the basic soldier improves his basic military skills and becomes MOS qualified. The engineer soldier, for example, receives more training in combat tactics and learns the technical skills which qualify him in his military occupational specialty (MOS), such as combat construction specialist, demolition specialist, or water-supply specialist. The training in this phase consists of general training and specialist training, which are interwoven throughout the entire advanced individual phase.

a. General Training. The objectives of general training are to train the soldier in engineer and additional military subjects which will insure that he is fully capable of performing the basic duties of an engineer soldier in the unit to which assigned; to insure that he is able to use and maintain in good repair engineer tools and equipment essential to unit operations; and to insure that he is capable of working or fighting for extended periods under adverse conditions. To be more specific, the engineer soldier is trained to—

- (1) Understand the nomenclature of engineer tools, equipment, materials, and tasks.
- (2) Use engineer hand and power tools in the equipment sets of the squad

and platoon with efficiency and safety, and to keep them in good repair.

- (3) Perform individual tasks in clearing, grubbing, lashing, rigging, rough carpentry, barbed wire erection, demolition, placing and removal of mines and boobytraps, lifting and carrying of heavy loads, and assembly of elements of fixed and floating bridges.
- (4) Recognize and report engineer information and correctly locate information on maps.
- (5) Dig a foxhole of sufficient depth and design to withstand the crushing effect of a tank passing over it or in the near vicinity.
- (6) Maintain his physical condition so he can march long distances and arrive at destination in condition to perform engineer missions or participate in combat.

b. Specialist Training. Specialist training prepares the soldier to perform the duties of his particular MOS. For instance, a water-production specialist will receive training in the characteristics of water and the operation of the diatomite filter, while a clerk-typist will be taught typing and administrative procedures. In our highly specialized army, practically every soldier has a more or less complex specialty. Most of these specialists can be trained in the unit, but some have to be sent to specialist schools. Since these schools sometimes last longer than the advanced individual phase, specialist training may extend into the unit training phase; these specialists often have to make up the general training which they missed while they were at school during the unit training phase. Personnel who complete specialist training before the beginning of the basic unit subphase should be given additional on-the-job training.

11-5. Unit Training Phases

After the fillers have become skilled they are taught to coordinate their efforts toward the accomplishment of the unit's missions. Most of the training throughout the phases is operational—the troops learn by doing.

a. Basic. During the basic unit training phase the individually skilled soldiers are trained to function progressively as members of squads, sections, platoons, and companies.

b. Advanced. During the advanced unit training phase, companies are trained to function together as an integral part of a battalion; the battalion is thus trained to operate as a unit. Combined arms training is achieved by progressively integrating the training of units of varying arms and services throughout these two phases. For example, each of the companies of the divisional engineer battalion trains with a brigade, and perhaps one or more artillery battalions, during this phase. Elements of the bridge company and equipment platoon are employed with the line companies. The command and staff of the various elements of the battalion receive practical and intensive training in their respective fields.

11-6. Field Exercise and Maneuver Phase

This phase provides for the training of large units under simulated combat conditions. These maneuvers include many types of units, to insure maximum combined arms training. For instance, in the advanced unit training phase the engineer line company has trained with its parent division engineer battalion and with a division brigade. During this phase, the entire battalion will work in general support of its parent division, and possibly, will be working in conjunction with engineer combat groups which have been placed in support of the division.

11-7. Operational Readiness Training Phase

a. Introduction. Operational readiness training is that stage of training undertaken by units which have completed the formal phases of training and which are assigned the responsibility for continuous readiness for deployment. There is no formal training program for this phase of training. The objectives of operational readiness training are contained in AR 350-1. Entry of units into this phase will be as determined by major commanders.

b. Concurrent Training. To make training more realistic and effective, arbitrary boundar-

ies between training phases must be avoided. Each subject is related to other subjects, and all subjects are intergrated into the team mission. This entails, to some degree, conducting basic and advanced individual, specialist, and unit training concurrently. Reviews of basic subjects are incorporated regularly in the progressive training phases. In many technical exercises, tactical requirements are included, such as providing security for bridge construction projects, and protecting working parties and obstacles from both ground and air attack. Throughout all phases of training, and particularly during unit training and field exercises and maneuvers, initiative and a sense of responsibility must be developed in officers, noncommissioned officers, and others who show potential leadership ability. Members of the battalion are instilled with the importance of making decisions in situations which are not covered by specific orders. Each commander includes leadership exercises in all training phases, particularly during periods of tactical and technical training. Command is decentralized, and interference with subordinate commanders is kept to a minimum. Additional

training for staff officers and other key personnel may be received in special schools conducted by battalion or higher headquarters.

c. Training of Other Arms and Services. The engineer battalion is sometimes called upon to conduct a demonstration of mine laying, mine clearing, or bridge construction for non-engineer troops of the division. Such demonstrations usually are staged by squads or platoons. The battalion frequently furnishes individual instructors in engineer subjects for the training of other troops. Subjects taught include mine warfare, use of explosives, camouflage, rigging, field fortifications, and bridge and road building expedients. Instructors usually are selected from the officers or key noncommissioned officers of the line companies.

11-8. Training References

The following publications are essential for effective training in the divisional engineer battalion.

a. The current issues of TOE 5-145, 5-146, 5-147, 5-148, 5-155, 5-156 and 5-157.

b. Army training programs, Field Manuals, and Technical Manuals as listed in appendix A.

APPENDIX A

REFERENCES

A-1. Department of the Army Pamphlets (DA Pam)

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|------------|--|
| 310-series | Indexes Pertaining to Administration, Training, Maintenance, and Supply. |
| 750-1 | Preventive Maintenance Guide for Commanders. |

A-2. Army Regulations and Special Regulations (AR and SR)

- | | |
|-------------|---|
| 55-203 | Movements of Nuclear Weapons Components and Nuclear Weapons Materiel. |
| 190-60 | Physical Security Standards for Nuclear Weapons. |
| 220-346 | Journals and Journal Files. |
| 320-5 | Dictionary of United States Army Terms. |
| 320-50 | Authorized Abbreviations and Brevity Codes. |
| 350-1 | Army Training. |
| 380-5 | Safeguarding Defense Information. |
| 580-15 | Security Requirements for Nuclear Weapons. |
| 600-20 | Army Command Policy and Procedures. |
| 611-101 | Manual of Commissioned Officer Military Occupational Specialties. |
| 611-112 | Manual of Warrant Officer Military Occupational Specialties. |
| (C) 611-202 | Manual of Enlisted Military Occupational Specialties (U). |
| 622-5 | Qualification and Familiarization. |
| 750-1 | Maintenance Concepts. |
| 750-8 | Command Maintenance Management Inspections. |

A-3. Field Manuals (FM)

- | | |
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| 3-5 | Chemical, Biological, and Radiological (CBR) Operations. |
| 3-10 | Chemical and Biological Weapons Employment. |
| 3-12 | Operational Aspects of Radiological Defense. |
| 3-50 | Chemical Smoke Generator Units and Smoke Operations. |
| 5-1 | Engineer Troop Organizations and Operations. |
| 5-20 | Camouflage, Basic Principles and Field Camouflage. |
| 5-22 | Camouflage Materials. |
| 5-23 | Field Decoy Installations. |
| 5-25 | Explosives and Demolitions. |
| (S) 5-26 | Employment of Atomic Demolition Munitions (ADM) (U). |
| 5-29 | Passage of Mass Obstacles. |
| 5-30 | Engineer Intelligence. |
| 5-34 | Engineer Field Data. |
| 5-35 | Engineers' Reference and Logistical Data. |
| 5-36 | Route Reconnaissance and Classification. |
| 5-142 | Nondivisional Engineer Combat Units. |

5-144	Engineer Shore Assault Units.
7-11	Rifle Company, Infantry, Airborne, and Mechanized Infantry.
7-20	Infantry, Airborne Infantry, and Mechanized Infantry Battalions.
7-30	Infantry, Airborne, and Mechanized Division Brigades.
8-35	Transportation of the Sick and Wounded.
8-50	Bandaging and Splinting.
9-6	Ammunition Unit Operations in the Field Army.
9-30	Maintenance Battalion, Division Support Command.
10-50	Supply and Transport Battalion, Division Support Command.
10-63	Handling of Deceased Personnel in Theaters of Operations.
12-11	Administration Company, Airborne, Armored, Infantry, and Mechanized Divisions.
17-1	Armor Operations.
17-15	Tank Units; Platoon, Company, and Battalion.
17-30	The Armored Division Brigade.
19-40	Enemy Prisoners of War and Civilian Internees.
20-32	Land Mine Warfare.
20-33	Combat Flame Operations.
21-5	Military Training Management.
21-6	Techniques of Military Instruction.
21-10	Military Sanitation.
21-11	First Aid for Soldiers.
21-26	Map Reading.
21-30	Military Symbols.
21-40	Small Unit Procedures in Chemical, Biological, and Radiological (CBR) Operations.
21-41	Soldiers' Handbook for Chemical and Biological Operations and Nuclear Warfare.
21-48	Chemical, Biological, and Radiological (CBR) and Nuclear Defense Training Exercises.
21-60	Visual Signals.
22-5	Drill and Ceremonies.
24-18	Field Radio Techniques.
24-20	Field Wire and Field Cable Techniques.
27-10	The Law of Land Warfare.
30-5	Combat Intelligence.
30-10	Terrain Intelligence.
31-10	Barriers and Denial Operations.
31-15	Operations Against Irregular Forces.
31-22	U. S. Army Counterinsurgency Forces.
31-25	Desert Operations.
31-30	Jungle Training and Operations.
31-50	Combat in Fortified and Builtup Areas.
31-60	River Crossing Operations.
31-70	Basic Cold Weather Manual.
31-71	Northern Operations.
31-72	Mountain Operations.
33-1	Psychological Operations—U. S. Army Doctrine.
54-2	Division Support Command.
61-100	The Division.

100-5	Field Service Regulations—Operations.
100-10	Field Service Regulations—Administration.
101-5	Staff Officers' Field Manual; Staff Organization and Procedure.
101-10-1	Staff Officers' Field Manual; Organizational, Technical, and Logistical Data—Unclassified Data.
101-10-2	Staff Officers' Field Manual; Organizational, Technical, and Logistical Data—Extracts of Tables of Organization and Equipment.
(S) 101-10-3	Staff Officers' Field Manual; Organizational Technical and Logistical Data—Classified Data (U).
101-31-1	Staff Officers' Field Manual; Nuclear Weapons Employment.
(S) 101-31-2	Staff Officers' Field Manual; Nuclear Weapons Employment (U).
101-31-3	Staff Officers' Field Manual; Nuclear Weapons Employment.

A-4. Technical Manuals (TM)

3-210	Fallout Prediction.
3-220	Chemical, Biological, and Radiological (CBR) Decontamination.
3-225	Radiological Recovery of Fixed Military Installations.
3-1040-209-series	Flamethrower, Mechanized Main Armament, M 10-8.
5-210	Military Floating Bridge Equipment.
5-216	Armored Vehicle Launched Bridge.
5-220	Passage of Obstacles Other Than Minefields.
5-277	Panel Bridge, Bailey Type, M2.
5-302	Construction in the Theater of Operations.
5-312	Military Fixed Bridges.
5-330	Planning, Site Selection, and Design of Roads, Airfields, and Heliports in the Theater of Operations.
5-335	Drainage Structures, Subgrades, and Base Courses.
5-460	Carpentry and Building Construction.
5-461	Engineer Handtools.
5-700	Field Water Supply.
5-725	Rigging.
9-1910	Military Explosives.
9-1375-200	Demolition Materials.
21-200	Physical Conditioning.
21-300	Driver Selection and Training (Wheeled Vehicles).
21-301	Driver Selection, Training, and Supervision; Tracked Vehicles.
38-750	Army Equipment Record Procedures.
38-750-1	Maintenance Management; Field Command Procedures.

A-5. Army Training Programs (ATP)

5-25	Airborne, Armored, Infantry, and Mechanized Division Engineer Battalion.
21-114	Male Military Personnel Without Prior Service.

A-6. Stanags

2071 Orders to the Demolition Guard Commander.



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APPENDIX B

RECOMMENDED OUTLINE FOR AN SOP

Standing Operating Procedure

Hq,-----Engr Bn
APO-----, US Army
DATE

Section I. INTRODUCTION

1. APPLICATION (to operations, relations to prior SOP's, lower units to conform).
2. PURPOSE
3. REFERENCES (AR's, FM's, and TM's)—Annex A.
4. RESPONSIBILITY FOR SOP (preparation, changes, and revisions).
5. EFFECTIVE DATE

Section II. COMMAND, STAFF, AND LIAISON

6. ORGANIZATION

- a. Normal.
- b. Special Internal Attachments and Organization.
- c. Normal and Special External Attachment and Support (brigades, tasks forces, etc.).

7. COMMAND POSTS

- a. Normal location (in relation to the next higher headquarters).
- b. Reporting Change of Location (coordinates and time).
- c. Forward CP's.
 - (1) When (situation for which required).
 - (2) How organized.
 - (3) Personnel and equipment.

8. STAFF DUTIES

- a. Duties That Are Special or Additional to Those in FM 5-1 and FM 101-5.
- b. Duties of Such Other Important Special Staff Officers as the Commander Desires To Prescribe (paragraph for each).

9. LIAISON (FM 5-1 and FM 101-5)

- a. Duties of Liaison Officers.
- b. Responsibilities of Liaison (with next higher, lower, and adjacent units).

Section III. ADMINISTRATION

10. GENERAL (Channels) (FM 100-10)

11. REPORTS

- a. Routine.
- b. Special.
- c. Information Concerning Submission of Reports—Annex B.
 - (1) Title and reports control symbol.
 - (2) Form of report.
 - (3) Date due.
 - (4) Number of copies.
 - (5) Negative report required or permissible.

12. PROMOTIONS (policies)

- a. Officer.
- b. Enlisted.
- c. Battlefield.

13. COURTS-MARTIAL (MCM, US 1951)

- a. Local Jurisdiction.
- b. Procedure for Submitting Charges.

14. MAIL

- a. Handling Official Mail.
- b. Handling Personal Mail.

15. LEAVES AND PASSES

- a. Policy of Command (frequency, conduct, VD policies, etc.).
- b. Authority To Grant.

16. JOURNALS AND HISTORY (AR 220-346)

- a. Responsibility for Unit Journal and History.
- b. Maintenance of Staff-Section Journals.

17. DISTRIBUTION OF MILITARY PUBLICATIONS (AR 310-1).

18. HANDLING PRISONERS OF WAR

- a. Reference to FM 19-40 and FM 27-10.
- b. Special Instructions for Capturing Units.

19. AWARDS AND DECORATIONS

- a. Channels.
- b. Forms.
- c. Presentations.

20. ORDERS (FM 101-5)

- a. Combat Orders.
- b. Memoranda of Combat Orders to S3.

21. BILLETS AND ASSEMBLY AREAS

- a. Billeting Policies (occupation and vacating).
- b. Billeting Party (organization and duties).

Section IV. RECONNAISSANCE, INTELLIGENCE, AND COUNTERINTELLIGENCE

22. RECONNAISSANCE

- a. Reconnaissance a Continuing Function.
- b. Essential Elements of Engineer Information.

23. ENGINEER INTELLIGENCE (FM 30-5)

- a. Evaluation.
- b. Preparation of Reports.
- c. Dissemination.

24. COMBAT INTELLIGENCE (FM 30-5)

- a. Definition of "Spot Report."
- b. "Spot Report" Required.
 - (1) Initial contact with enemy.
 - (2) Marked changes in enemy disposition or situation.
 - (3) Attack by enemy ground, aircraft, or airborne forces.
 - (4) New units identified.
 - (5) Enemy strength, composition, and movement.
 - (6) Location of enemy installations.
 - (7) Use of chemicals or new weapons.
 - (8) New enemy materials or equipment.

25. COUNTERINTELLIGENCE

- a. Mail Censorship.
- b. Blackout Discipline.
- c. Extent of Information Given, if Captured.
- d. Signs and Countersigns.
- e. Destruction of Classified Material.
- f. Civilian Control.
- g. Secrecy Discipline.
- h. Information to Press Representatives.

Section V. OPERATIONS

26. ORDERS (FM 101-5)

- a. Fragmentary Orders.
- b. Written Orders.
- c. Use of Overlays, Tables, and Charts.

27. SECURITY—ANNEX C

- a. Responsibilities of Battalion in Rear Area.
- b. Responsibilities of Unit Commander.

28. COMBAT

- a. Reorganization for Combat, Annex D.
- b. Responsibility for Contact.
- c. Coordination of Request for Fire Support and Tactical Air Support.
- d. Spot Reports.
- e. Situation Reports.
- f. Minefields.

g. CBR and Nuclear Warfare. Annex E.

- (1) Defensive.
- (2) Offensive.

h. Smoke.

- (1) Request for use.
- (2) Coordination.

i. Defense Against Air Attack.

j. Employment of ADM. Annex F.

k. Bomb and Shell Disposal.

29. MOVEMENT

a. General.

- (1) What constitutes a convoy.
- (2) Required road clearances.
- (3) Requests for augmented transportation.
- (4) Loading plan. Annex G.

b. Responsibilities.

(1) S-1.

- (a) Coordination with civil and military police.
- (b) Commands quartering party.

(2) S-2.

- (a) Security of bivouac and halt areas.
- (b) Reconnaissance of route.
- (c) Posting of road guides.

(3) S-3.

- (a) Warning order.
- (b) Movement order.
- (c) Selects routes.
- (d) Arranges for road clearances.

(4) S-4.

- (a) Arranges for augmented transportation.
- (b) Responsible for traffic planning.

(5) Engineer equipment officer.

Responsible for maintenance.

(6) Company commander.

- (a) Prepares company loading plan.
- (b) Furnishes S-3 with lists of vehicles, equipment, and materials.
- (c) Conducts necessary training for movement.
- (d) Polices area.

c. Motor Movement. Annex H.

d. Rail Movement. Annex I.

e. Alert Plans.

- (1) Unit plans.
- (2) Alert rosters.

Section VI. LOGISTICS

30. CLASS I SUPPLY

a. Ration Pickup.

b. Daily Ration Return and Ration Cycle.

- c. Reserve Rations Carried.
 - (1) By unit.
 - (2) By individual.
 - d. Responsibility for Attached Units.
- 31. WATER PROCESSING AND PURIFICATION
 - a. Authorized Sources.
 - b. Purification by Expedient Methods.
 - c. Water Economy.
- 32. CLASS II AND CLASS IV SUPPLY
 - a. Requisition Days for Various Services.
 - b. Pickup Procedure.
 - c. Salvage Turn-in Procedure.
 - d. Droppage by "Battle Loss Certificate."
 - e. Basic Loads. Annex J.
- 33. CLASS III SUPPLY
 - a. Method of Supply.
 - b. Fuel Sources.
- 34. CLASS V SUPPLY
 - a. Method of Requisitioning.
 - b. Forms Used and Certificates Required.
 - c. Basic Load. Annex J.
 - d. Salvage.
- 35. MAINTENANCE OF VEHICLES AND EQUIPMENT
 - a. Organizational Maintenance.
 - b. Maintenance Officer's Responsibilities.
 - c. Forms Used.
 - d. Priorities.
- 36. REPAIR PARTS
 - a. Method of Requisitioning Engineer and Ordnance.
 - b. Maintenance of Stock Levels.
 - c. Inspection for Maintenance and Stock Levels.
 - d. Parts and Equipment Records.
- 37. EVACUATION OF VEHICLES AND EQUIPMENT
 - a. Division Support Command.
 - b. Maintenance Battalion.
- 38. EVACUATION AND HOSPITALIZATION—Annex K.

Section VII. COMMUNICATIONS

- 39. COMMUNICATION BETWEEN UNITS
 - a. Radio (FM 24-18). Annex L.
 - b. Wire (FM 24-20). Annex M.
 - c. Responsibility for Installation.
 - d. Visual (FM 21-60).

40. COMMUNICATION PROCEDURES

- a. Division Communications.
- b. Radiotelephone Voice Procedure (FM 24-18 and FM 24-20).
- c. Citation of SOI and SSI of Higher Headquarters.

41. MAINTENANCE RESPONSIBILITIES OF COMMUNICATIONS OFFICER

GREEN
Lt Col

- Annex A—References (omitted)
- B—Reports (omitted)
- C—Security
- D—Reorganization for Combat
- E—CBR and Nuclear Warfare
- F—Employment of ADM (omitted) (See FM 5-26)
- G—Loading Plan (omitted)
- H—Motor Movement
- I—Rail Movement
- J—Basic Loads (omitted)
- K—Evacuation and Hospitalization (omitted)
- L—Radio Communication Nets (omitted)
- M—Wire Communication Nets (omitted)

OFFICIAL

/s/Black

BLACK

Adj

ANNEX C (SECURITY) TO SOP, -----ENGINEER BATTALION

1. GENERAL SECURITY

Policy and Responsibilities.

2. SECURITY DURING MOVEMENT

- a. Air Guards.
- b. Manning of Vehicular Weapons.
- c. Camouflage During Halts.
- d. Advance, Flank, and Rear Guards.
- e. Action in Case of Attack.
 - (1) Air.
 - (2) Mechanized.
 - (3) Nuclear, biological, and chemical.

3. SECURITY IN ASSEMBLY AREA (FM 5-15, FM 5-20, FM 5-31 and FM 61-100).

- a. Camouflage.
- b. Mines and Booby Traps.
- c. Placement of Weapons.

- (1) Air attack.
 - (2) Mechanized.
 - (3) Nuclear, biological, and chemical.
- d. Joint Security.
- e. Security Plans.
- f. Sentry Posts and Outposts.
- 4. REAR-AREA OBSERVATION
 - a. Formation of Rear-Area Observation Groups.
 - b. Selection of Rear-Area Observation Posts.
 - c. Twenty-Four-Hour Manning Posts.
 - d. Observation of Rear Areas When Required.
 - e. Communications for Observation Posts.
- 5. SECURITY OF WORKING PARTIES
 - a. Responsibility.
 - b. Camouflage of Equipment.
 - c. Combat Readiness.
- 6. SECURITY WARNING SIGNALS
 - a. Air Attack.
 - b. Airborne Attack.
 - c. Mechanized Attack.
 - d. Nuclear, Biological, and Chemical Attack.
- 7. FIRE SAFETY AND FIREFIGHTING
 - a. Plan (general).
 - b. Fire Personnel and Duties.
 - c. Safety Rules (motor pools, kitchens, and so forth).
- 8. ALERT PLANS
 - a. Unit Plans.
 - b. Alert Roster.

ANNEX D (REORGANIZATION FOR COMBAT TO SOP,
 -----ENGINEER BATTALION

- 1. GENERAL
 - a. Requirement.
 - b. Prior Approval of the Battalion Commander.
- 2. DESIGNATION OF FORWARD ECHELON
 - a. Personnel.
 - b. Equipment.
- 3. DESIGNATION OF REAR ECHELON
 - a. Personnel.
 - b. Equipment.

4. SUPPLY

- a. Ammunition.
- b. Unit Trains.

5. COMMUNICATIONS

6. MEDICAL EVACUATION

7. STATEMENT OF EFFECT ON REGULAR MISSION

ANNEX E (CBR AND NUCLEAR WARFARE) TO SOP,-----
ENGINEER BATTALION

1. GENERAL

- a. Purpose.
- b. Subordinate Units To Issue SOP's To Conform.

2. REFERENCES

- a. FM 21-40 (other pertinent doctrinal sources).
- b. Division Training Directive No. -----.
- c. Orders, SOP's and Annexes.

3. ORGANIZATION

- a. Command and Staff Structure.
- b. Specialists.

4. RESPONSIBILITIES

- a. Individual.
- b. Company Commanders.
 - (1) Plans.
 - (2) Proficiency of unit personnel.
 - (3) Safeguarding and processing of captured enemy CBR personnel and equipment.
 - (4) Unit CBR equipment.
 - (5) First- and second-echelon decontamination.
- c. Large-Scale Decontamination (see Engineer Annex, Div SOP No. -----).

5. DISPERSION

Guide to Minimum Distance Maintained Between Various Type Sections.

6. CBR ALARMS

- a. General Alarm. Attack Considered Imminent.
- b. Actual Attack.
- c. All Clear.

7. PROCEDURE IN CASE OF CBR OR NUCLEAR ATTACK

- a. Action Prior to Attack.
- b. Action During Attack.

- (1) Protective equipment.
- (2) Cover and movement.
- (3) Unit protective measures.
- (4) Coordination between higher, lower, and adjacent units.

c. Action After Attack.

- (1) All-clear signal.
- (2) Continuation of mission.
- (3) Resupply of protective equipment and material.
- (4) Marking and reporting of contaminated areas.
- (5) Decontamination.

8. PROTECTION

- a. Individual.
- b. Unit.
- c. Tactical.

9. SUPPLY

- a. Emergency Requisitions.
- b. Authorized Levels of CBR Equipment.

10. TRAINING

See Division Training Directive No. _____.

ANNEX H (MOTOR MOVEMENT) TO SOP, _____ ENGINEER BATTALION

1. GENERAL (Division SOP and march orders).

- a. Preparation of Vehicles.
- b. Motor Marches.
 - (1) Strip maps.
 - (2) Route reconnaissance.
 - (3) Messing and refueling.
 - (4) Night marches.
 - (5) Composition of march units and serials.
 - (6) Distances to be maintained.
 - (7) Speeds and rate of march.
 - (8) Posting of traffic guards during halts.
- c. Conduct of Personnel During Movement.
- d. Maintenance on Marches and Movement.

2. VEHICLE AND EQUIPMENT REGULATIONS

- a. Motor Pool
 - (1) Dispatch.
 - (2) Service.
 - (3) Maintenance.
- b. Regulations for Administrative Vehicles.

ANNEX I (RAIL MOVEMENT) TO SOP, ----- ENGINEER
BATTALION

1. ACTION BY S1

Troop Lists.

2. ACTION BY S2

- a.* Railroad Reconnaissance Report.
- b.* Security.

3. ACTION BY S3.

- a.* Determine Rolling-Stock Requirements.
- b.* Coordinate Loading Plans.
- c.* Prepare Loading Schedule and Designate Areas.

4. ACTION BY S4.

- a.* Initiate Transportation Requests.
- b.* Troop and Guard Mess.
- c.* Procurement of Blocking Materiel and Dunnage.
- d.* Prepare Shipping Documents.
- e.* Movement Policy.
- f.* Designation of Movement Control Personnel.

APPENDIX C

EXAMPLES OF ENGINEER ANNEXES TO A DIVISION OPERATION PLAN

EXAMPLE 1. ENGINEER ANNEX TO A DIVISION OPERATION PLAN

(Not a Copy of Any Known Plan.)

(Classification)

(No change from verbal orders except paragraph 1b(3).)

Copy No. 5
4th Division
TOWNVILLE (XU2484)
AGGRESSORLAND
251500 Jul 19
MCR3

Annex D (Engineer) to Operation Plan STORM

References: Maps, AGGRESSORLAND, 1:50,000, TOWNVILLE, FARMVILLE, DELTA, revised May 19--.

1. SITUATION

- a. Enemy forces. Annex A (Intelligence) to OPLAN STORM.
- b. Friendly forces.
 - (1) Annex B (Operations Overlay) to OPLAN STORM.
 - (2) Appendix 1 (Barrier Plan) to Annex B (Operations Overlay) to OPLAN STORM.
 - (3) Corps Arty furnishes AD protection to engineer equipment parks, bridge and ferry sites in zone.
 - (4) Corps engineer assumes responsibility for division engineer area and task assignments at effective time and date of execution of OPORD 13.
- c. Attachments and detachments.
 - 121st Engr Bn (C) attached effective 260400 July 19--.
- d. Assumptions.
 - (1) Para 1d OPLAN STORM.
 - (2) Terrain will initially require utilization of AVLB. During Phase 2 stream crossings will require rafting and float bridge equipment.

(Classification)

(Classification)

2. MISSION

Organic and attached engineer units support operation by breaching obstacles and minefields, maintaining roads in zone, and constructing bridges over streams and dry gaps.

3. EXECUTION

a. Concept of operations.

- (1) Paragraph 3a, OPLAN STORM.
- (2) Organic engineer units will provide support to committed brigades with priority of support to _____. _____ brigades. Organic Bn (—) and attached Engr Bn (C) will provide general support on area basis, prepared to provide direct support to _____ brigade when committed.

b. 4th Engr Bn.

- (1) Attach one Engr Co reinforced with one platoon and one Sec AVLB of Bridge Co to _____ brigade.
- (2) Attach one Engr Co reinforced with one Sec AVLB to _____ brigade.
- (3) Bn (—): GS.
- (4) Be prepared to attach one Engr Co reinforced with heavy raft platoon of Bridge Co to _____ brigade on order.
- (5) Be prepared to establish a minimum of three WSP east of NARROW River.

c. 121st Engr Bn (C).

- (1) Operate 3 WSP in zone.
- (2) Maintain Div MSR.
- (3) Be prepared to assist in construction of floating and/or fixed bridges on order.
- (4) Be prepared to conduct roadblocks east of DELTA (XY4188) on order.

d. Coordinating instructions.

- (1) WSP will be leapfrogged to insure continuous water supply.
- (2) Direct liaison authorized between 4th Div Engr and 1st and 2d Div Engr.
- (3) After opening bridges across NARROW River, maintain two rafts in operation at each bridge site for return traffic until 261800 Jul 19____.
- (4) This plan effective for planning on receipt, becomes OPORD 13 for execution on Div order.

(Classification)

(Classification)

4. ADMINISTRATION AND LOGISTICS

- a. ADMINO 5 remains in effect, except paragraph 1b.
- b. App 1—Allocation of Engr C1 I, II, and IV, Equip and Sup.
- c. Location of Engr Equip parks as follows:
 - (1) No. 1—Vic HIGH RIDGE (VT2439).
 - (2) No. 2—LOW KNOB (ST 2324).
 - (3) No. 3—FLAT LAND (TT2556).

5. COMMAND AND SIGNAL

- a. Annex H (Signal) to OPLAN STORM; Index 9, SOI.
- b. CP's:
 - (1) 4th Engr Bn, TOWN (AB4087).
 - (2) Other CP's report location.
- c. Axis of signal communications. TOWN (AB4087)—VILLAGE (EF6389)—CITY (IT7843).

Acknowledge.

FLEXO
Maj Gen

Appendixes: Appendix I—Allocation of Engr C1 I, II, and IV Equip and
Sup (omitted)

DISTRIBUTION: A

OFFICIAL:

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PRICE

G3

(Classification)

EXAMPLE 2. BARRIER ANNEX TO A DIVISION
OPERATION PLAN

(Not a Copy of Any Known Plan)

(Classification)

(No change from verbal orders.)

Copy No. 3
4th Division
BOBS (RC4098)
AGGRESSORLAND
181945 Feb 19__
GCW 7

ANNEX F (Barrier Plan) to Operation Plan LANCE

Task Organization: Annex A, Task Organization, to OPLAN LANCE.

References: Maps, AGGRESSORLAND, 1:100,000, ROTHEN, Edition 5;
AGGRESSORLAND, 1:500,000, MERGEN, Edition 2.

1. SITUATION

- a. Enemy forces. Annex B (Intelligence) to OPLAN LANCE.
- b. Friendly forces.
 - (1) Paragraph 1b, OPLAN LANCE.
 - (2) 11th Engr Gp (C) supports 4th Div with one Float Bridge Company or order.
- c. Attachments and detachments.
 - 11th Engr Bn (C) attached effective 181945 Feb 19__.
- d. Assumptions.
 - (1) Paragraph 1d, OPLAN LANCE.
 - (2) Forward units will have a minimum of 24 hours to prepare barrier before receiving enemy pressure.

2. MISSION

Division, acting as corps covering force, executes barrier system and extends corps barrier in sector to disorganize, deceive, and delay the enemy in front of the GOP, and to force concentration of enemy forces in the valley of the UMP and WACH Rivers if RED River is crossed.

3. EXECUTION

- a. Concept of operations.
 - (1) Paragraph 3a, OPLAN LANCE.

(Classification)

(Classification)

- (2) Barrier system east of RED River designed to disorganize, deceive and delay the enemy; barrier system west of RED River designed to force concentration of enemy forces in the valleys of the UMP and WACH Rivers.

b. ----- Brigade.

Barrier	Priority	Target date for completion	Remarks
BAL River --	1	191945	Demolish all bridges on BAL River; crater, demolish, and mine with both AT and APers mines the approaches through ridge MESSEL (EF4810)-BRON (GH5107).
E -----	1	191945	Crater and mine defile at ALT (H14598) with AT and APers mines.
FK -----	2	211800	Mine saddle from WEIGER (BL4000) to Jung (BC4007) with AT mines only.
HL -----	3	211800	Mine ridge UTTING (EF4299) to RJ at EF425990 with AT mines only.

c. ----- Brigade.

Barrier	Priority	Target date for completion	Remarks
AB -----	1	200200	Mine entrance to UMP River Valley with both AT and APers mines; improve RED River banks to form effective obstacles; demolish bridges over RED River on Div order.
BD -----	2	210600	Prepare wire obstacles and mine ridge with AT mines; be prepared to reinforce with APers mines.
AE -----	3	211800	Mine UMP River Valley with both AT and APers mines.

d. ----- Brigade.

Barrier	Priority	Target date for completion	Remarks
BC -----	1	191945	Improve RED River banks to form effective obstacle and mine with both AT and APers mines; demolish all bridges over RED River on Div order.
DG -----	2	210600	Prepare wire obstacles and mine ridges D to G with AT mines only initially; be prepared to reinforce with APers mines.
GI -----	3	211800	Mine WACH Valley with both AT and APers mines.

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(Classification)

e. 4th Engr Bn.

Barrier	Priority	Target date for completion	Remarks
JK -----	1	201945	Mine ridge with AT mines only initially; be prepared to reinforce with APers mines on order.
EJ -----	1	201945	Prepare for demolition all bridges over UMP River; mine with both AT and APers mines.
IM -----	2	211800	Prepare for demolition all bridges over WACH; mine with both AT and APers mines.

f. 11th Engr Bn (C).

Barrier	Priority	Target date for completion	Remarks
KLM -----	1	201945	Mine ridge with AT mines only initially; be prepared to reinforce with APers mines on order.
MP -----	2	211800	Prepare for demolition all bridges over WACH; mine with both AT and APers mines.

g. Coordinating instructions.

- (1) Brigades will prepare additional barriers forward of GOP which block high speed avenues of approach and lateral barriers between adjacent brigades.
- (2) Brigades coordinate extent of and location of lanes and gaps with adjacent corps. Direct liaison is authorized.
- (3) Provisions will be made to cover barriers with heavy weapons fire; smallarms fire coverage wherever possible.
- (4) Gaps and lanes in minefields will remain open until ordered closed by Div Hq or until threat of capture by the enemy.
- (5) Demolitions, including bridges and cratering of routes, executed only on order Div Hq or on brigade order if threat of capture by the enemy is imminent
- (6) Appendix 1, Barrier Overlay.
- (7) Appendix 2, Minefield Location Plan.
- (8) Appendix 3, Obstacles and Demolitions Plan.
- (9) This barrier plan not taken forward of brigade CP.
- (10) This plan effective for planning or receipt becomes OPORD 25 on Div order.

(Classification)

(Classification)

4. ADMINISTRATION AND LOGISTICS

- a. ADMINO 18 continues in effect except paragraph 1b.
- b. AT and APers mines, demolitions, and napalm available ASP 182100 Feb 19__.
- c. Minefield marking materials, wire, and fortifications materials available Sup Pt 182100 Feb 19__.

5. COMMAND AND SIGNAL

- a. Signal. Index 3, SOI.
- b. Reports.
 - (1) Minefields. Report intended location, extent, estimated time of completion, type and density of mines; follow with standard minefield laying report including sketches.
 - (2) Other obstacles and demolitions. Report location, type, extent, and estimated time of completion.

Acknowledge.

FLEXO
Maj Gen

Appendixes: 1—Barrier Overlay (omitted)
2—Minefield Location Plan (omitted)
3—Obstacles and Demolitions Plan (omitted)
4—Allotment of C1, I, IV, and V Equipment and Supply
(omitted)

DISTRIBUTION: A

2d Corps
3d Corps

OFFICIAL:

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PRICE

G3

(Classification)



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APPENDIX D

ORDERS TO THE DEMOLITION GUARD COMMANDER AND TO THE DEMOLITION FIRING PARTY

1. Three commanders normally are concerned with the execution of a demolition—
 - a. The military authority who has overall responsibility, i.e. the officer empowered to order the firing of the demolition (referred to hereafter as "the authorized commander").
 - b. The commander of the demolition guard.
 - c. The commander of the demolition firing party.
2. Each authorized commander will—
 - a. Determine the requirement and allot responsibility for a demolition guard.
 - b. Establish a clear cut channel from himself to the commander of the demolition guard for transmission of the order to fire the demolition.
 - c. Insure that this channel is known and understood by all concerned.
 - d. Insure a positive, secure means for transmitting the order to fire.
 - e. Specify whether the demolition guard commander is authorized to order the firing of the demolition on his own initiative if the enemy is in the act of capturing it.
3. Where a demolition is to be prepared which is important to the operational plan, the authorized commander normally will appoint a demolition guard, the commander of which will be responsible for—
 - a. Insuring, if so ordered, that the demolition is not captured intact by the enemy, and,
 - b. Giving to the demolition firing party commander the orders for changing the state of readiness of the demolition and the firing orders.
4. The following formats will be used for the orders to the commander of a demolition guard and the commander of a demolition firing party whenever time and conditions permit. After all parts of these formats have been completed by the appropriate authority they will be issued to the commanders of the demolition guard and the demolition firing party and will be retained by them until the demolition has been completed.
5. The contents and paragraph numbers of the formats issued by each authority will conform exactly to the following examples.
6. To facilitate the use of these formats, it is recommended that general instructions be included in appropriate unit standing operating procedures.

Serial No. _____ Security Classification _____

ORDERS TO THE DEMOLITION GUARD COMMANDER

- NOTES. 1. This form will be completed and signed before it is handed to the commander of the demolition guard.
2. In completing the form, all spaces must either be filled in or lined out.
3. The officer empowered to order the firing of the demolition is referred to throughout as the "authorized commander."

From _____ To _____

PART I—PRELIMINARY INSTRUCTIONS

1. *a.* Description of target _____
- b.* Location:
 - Map Name and Scale _____
 - Sheet No. _____
 - Grid Reference _____
- c.* Codeword or codesign (if any) of demolition target _____
2. The authorized commander is _____
- (give appointment only). If this officer should delegate this authority, you will be notified by one of the methods shown in paragraph 4, below.
3. The Demolition Firing Party has been/will be provided by _____
4. All messages, including any codewords or codesign (if any) used in these orders will be passed to you by—
 - a.* Normal command wireless net, or
 - b.* Special liaison officer with communications direct to the authorized commander, or
 - c.* Telephone by the authorized commander, or
 - d.* The authorized commander personally, or
 - e.* _____

(Delete those NOT applicable)

NOTE. All orders sent by message will be prefixed by the codeword or codesign (if any) at paragraph 1c, and all such messages must be acknowledged.

PART II—CHANGING STATES OF READINESS

5. The demolition will be prepared initially to the State of Readiness _____ by _____ hours on _____ (date).

6. On arrival at the demolition site, you will ascertain from the commander of the demolition firing party the estimated time required to change from State "1" (SAFE) to State "2" (ARMED). You will insure that this information is passed to the authorized commander and is acknowledged.

7. Changes in the State of Readiness from State "1" (SAFE) to state "2" (ARMED) or from State "2" to State "1," will be made only when so ordered by the authorized commander. However, the demolition may be ARMED in order to accomplish emergency firing when you are authorized to fire it on your own initiative.

8. A record of the changes in the State of Readiness will be entered by you in the table below, and on the firing orders in possession of the commander of the demolition firing party.

State of Readiness order "1" (SAFE) or "2" (ARMED)	Time and date change to be completed	Authority	Time and date of receipt of order

NOTE: If the order is transmitted by an officer in person, his signature and designation will be obtained in the column headed "Authority."

9. You will report completion of all changes in the State of Readiness to the authorized commander by the quickest means.

PART III—ORDERS FOR FIRING THE DEMOLITION

10. The order for firing the demolition will be passed to you by the authorized commander.

11. On receipt of this order you will immediately pass it to the commander of the demolition firing party on his demolition orders form ("Orders to the Commander of the Demolition Firing Party").

12. After the demolition has been fired you will report the results immediately to the authorized commander.

13. In the event of a misfire or only partially successful demolition you will give the firing party protection until such time as it has completed the demolition and report again after it has been completed.

PART IV—EMERGENCY FIRING ORDERS

- NOTES. 1. One subparagraph of paragraph 14 must be deleted.
2. The order given herein can only be altered by the issue of a new form, or, in emergency by the appropriate order (or code-word if used) in Part V.

14. *a.* You will order the firing of the demolition only upon the order of the authorized commander.

OR

b. If the enemy is in the act of capturing the target you will order the firing of the demolition on your own initiative.

PART V—CODEWORDS (IF USED)

Action to be taken	Codeword (if used)
a. Change State of Readiness from "1" to "2" (see para 7)	
b. Change State of Readiness from "2" to "1" (see para 7)	
c. Fire the demolition (see para 10)	
d. Paragraph 14 <i>a</i> is now cancelled. You are now authorized to fire the demolition if the enemy is in the act of capturing it.	
e. Paragraph 14 <i>b</i> is now cancelled. You will order the firing of the demolition only upon the order of the authorized commander.	
f. Special authentication instructions, if any.	

PART VI

Signature of officer issuing these orders _____

Name (printed in capital letters) _____

Rank _____ Appointment _____

Time of issue _____ hours, _____ (date).

PART VII—DUTIES OF THE COMMANDER OF THE DEMOLITION GUARD

15. You are responsible for—

- a. Command of the demolition guard and the demolition firing party.
- b. The safety of the demolition from enemy attack of sabotage.
- c. Control of traffic and refugees.
- d. Giving the orders to the demolition firing party in writing to change the state of readiness.
- e. Giving the order to the demolition firing party in writing to fire the demolition.
- f. After the demolition, reporting on its effectiveness to the authorized commander.
- g. Keeping the authorized commander informed of the operational situation at the demolition site.

16. You will acquaint yourself with the orders issued to the commander of the demolition firing party and with the instructions given by him.

17. The demolition guard will be so disposed as to insure at all times complete all-around protection of the demolition against all type of attack or threat.

18. The commander of the demolition firing party is in technical control of the demolition. You will agree with him on the site of your HQ and of the firing point. These should be together whenever practicable. When siting them you must give weight to the technical requirements of being able to view the demolition and have good access to it from the firing point.

19. You will nominate your deputy forthwith and compile a seniority roster. You will insure that each man knows his place in the roster, understands his duties and knows where to find this form if you become a casualty or are unavoidable absent. The seniority roster must be made known to the commander of the demolition firing party.

20. Once the state of readiness "2" (ARMED) has been ordered, either you or your deputy must always be at your HQ so that orders can be passed on immediately to the commander of the demolition firing party.

SECURITY CLASSIFICATION

ORDERS TO THE COMMANDER, DEMOLITION FIRING PARTY			SERIAL NUMBER	
NOTE: Parts I, II and III will be completed and signed before this form is handed to the commander of the Demolition Firing Party. Paragraphs 4 and 5 can only be altered by the authority issuing these orders. In such cases a new form will be issued and the old one destroyed.				
FROM:			TO:	
PART I - ORDERS FOR PREPARING AND CHARGING THE DEMOLITION TARGET				
1a. DESCRIPTION				
b. LOCATION			c. CODE WORD OF DEMOLITION TARGET (If any)	
MAP NAME AND SCALE	SHEET NO.	GRID REFERENCE		
d. ATTACHED PHOTOGRAPHS AND SPECIAL TECHNICAL INSTRUCTIONS				
2. THE DEMOLITION GUARD IS BEING PROVIDED BY (Unit)				
3. YOU WILL PREPARE AND CHANGE THE DEMOLITION TARGET TO THE STATE OF READINESS				
BY _____ HOURS ON (Date) _____.				
ANY CHANGES MAY BE MADE ONLY ON THE ORDER OF THE ISSUING AUTHORITY, OR BY THE OFFICER DESIGNATED IN PARAGRAPH 4d AND WILL BE RECORDED BELOW.				
STATE OF READINESS ORDERED "1"(SAFE) or "2"(ARMED)	TIME AND DATE CHANGE TO BE COMPLETED	AUTHORITY	TIME AND DATE OF RECEIPT OF ORDER	
NOTE: All orders received by message will be verified by the code word at Paragraph 1c. If the order is transmitted by an officer in person, his signature and designation will be obtained in the Column headed "Authority".				
PART II - ORDERS FOR FIRING				
NOTE: The officer issuing these orders will strike out the subparagraphs of Paragraphs 4 and 5 which are not applicable. When there is a demolition guard, Paragraph 4 will always be used and Paragraph 5 will always be struck out.				
4a. YOU WILL FIRE THE DEMOLITION AS SOON AS YOU HAVE PREPARED IT.				
b. YOU WILL FIRE THE DEMOLITION AT _____ HOURS ON (Date) _____.				
c. YOU WILL FIRE THE DEMOLITION ON RECEIPT OF THE CODE WORD _____.				
d. YOU WILL FIRE THE DEMOLITION WHEN THE OFFICER WHOSE DESIGNATION IS _____ HAS SIGNED PARAGRAPH 8 BELOW.				
5. EMERGENCY FIRING ORDERS (ONLY applicable when there is NO demolition guard)				
a. YOU WILL NOT FIRE THE DEMOLITION IN ANY CIRCUMSTANCES EXCEPT AS ORDERED IN PARAGRAPH 4 ABOVE.				
b. YOU WILL FIRE THE DEMOLITION ON YOUR OWN INITIATIVE IF THE ENEMY IS IN THE ACT OF CAPTURING IT.				

DA FORM 2050-R, 1 NOV 57

SECURITY CLASSIFICATION

SECURITY CLASSIFICATION

PART III - ORDERS FOR REPORTING			
6. AFTER FIRING THE DEMOLITION YOU WILL IMMEDIATELY REPORT RESULTS TO THE OFFICER WHO ORDERED YOU TO FIRE. IN THE EVENT OF A PARTIAL FAILURE YOU WILL WARN HIM, AND IMMEDIATELY CARRY OUT THE WORK NECESSARY TO COMPLETE THE DEMOLITION			
7. FINALLY, YOU WILL IMMEDIATELY REPORT THE RESULTS TO YOUR UNIT COMMANDING OFFICER (See Paragraph 13.)			
SIGNATURE OF OFFICER ISSUING THESE ORDERS	NAME (In capitala) DESIGNATION	TIME OF ISSUE	DATE OF ISSUE
PART IV - ORDER TO FIRE			
8. BEING EMPOWERED TO DO SO, I ORDER YOU TO FIRE NOW THE DEMOLITION DESCRIBED IN PARAGRAPH 1.			
SIGNATURE	NAME (In capitala) DESIGNATION	TIME	DATE
PART V - GENERAL INSTRUCTIONS (Read These Instructions Carefully)			
9. YOU ARE IN TECHNICAL CHARGE OF THE PREPARATION, CHARGING AND FIRING OF THE DEMOLITION TARGET DESCRIBED. YOU WILL NOMINATE YOUR DEPUTY FORTHWITH AND COMPILE A SENIORITY ROSTER OF YOUR PARTY. YOU WILL INSURE THAT EACH MAN KNOWS HIS PLACE IN THE ROSTER, UNDERSTANDS THESE INSTRUCTIONS, AND KNOWS WHERE TO FIND THIS FORM IF YOU ARE HIT OR UNAVOIDABLY ABSENT. YOU WILL CONSULT WITH THE COMMANDER OF THE DEMOLITION GUARD ON THE SITING OF THE FIRING POINT.			
10. YOU MUST UNDERSTAND THAT THE COMMANDER OF THE DEMOLITION GUARD (where there is one) IS RESPONSIBLE FOR: a. OPERATIONAL COMMAND OF ALL THE TROOPS AT THE DEMOLITION SITE. (You are therefore under his command.) b. PREVENTING THE CAPTURE OF THE DEMOLITION SITE, OR INTERFERENCE BY THE ENEMY WITH DEMOLITION PREPARATIONS. c. CONTROLLING ALL TRAFFIC AND REFUGEES. d. GIVING YOU THE ORDER TO CHANGE THE STATE OF READINESS FROM "1(SAFE)" TO "2(ARMED)" OR BACK TO "1(SAFE)" AGAIN. YOU WILL INFORM HIM OF THE TIME REQUIRED FOR SUCH A CHANGE. e. PASSING TO YOU THE ACTUAL ORDER TO FIRE.			
11. WHEN THERE IS NO DEMOLITION GUARD AND YOU ARE INSTRUCTED IN PARAGRAPH 4 TO ACCEPT THE ORDER TO FIRE FROM SOME PARTICULAR OFFICER, IT IS IMPORTANT THAT YOU ARE ABLE TO IDENTIFY HIM.			
12. IF YOU GET ORDERS TO FIRE, OTHER THAN THOSE LAID DOWN IN PARAGRAPH 4, YOU SHOULD REFER THEM TO THE DEMOLITION GUARD COMMANDER OR, IF THERE IS NO DEMOLITION GUARD COMMANDER, TO YOUR IMMEDIATE SUPERIOR. IF YOU CANNOT DO THIS, YOU WILL ONLY DEPART FROM YOUR WRITTEN INSTRUCTIONS WHEN YOU ARE SATISFIED AS TO THE IDENTITY AND OVERRIDING AUTHORITY OF WHOEVER GIVES YOU THESE NEW ORDERS, AND YOU WILL GET HIS SIGNATURE IN PARAGRAPH 8 WHENEVER POSSIBLE.			
13. THE REPORT TO YOUR UNIT COMMANDING OFFICER, AS CALLED FOR IN PARAGRAPH 7, SHOULD CONTAIN THE FOLLOWING INFORMATION (where applicable): a. IDENTIFICATION REFERENCE OF DEMOLITION. b. MAP REFERENCE. c. TIME AND DATE WHEN DEMOLITION WAS FIRED. d. EXTENT OF DAMAGE ACCOMPLISHED, INCLUDING: - ESTIMATED WIDTH OF GAP - NUMBER OF SPANS DOWN) IN CASE OF A BRIDGE. - SIZE AND LOCATION OF CRATERS IN A ROAD OR RUNWAY. - MINES LAID. e. SKETCH SHOWING EFFECT OF DEMOLITION.			

SECURITY CLASSIFICATION



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